PB89-135362

Superfund Record of Decision (EPA Region 2)
Old Bethpage Landfill, Old Bethpage, New York
(First Remedial Action), March 1988

(U.S.) Environmental Protection Agency
Washington, DC

17 Mar 88

U.S. Department of Commerce
National Technical Information Service
NTIS

50272-101

REPORT DOCUMENTATION PAGE

1. REPORT NO. EPA/ROD/R02-88/058

2.

3. Recipient's Accession No. PB89 135362/AS

4. Title and Subtitle
SUPERFUND RECORD OF DECISION
Old Bethpage, NY
First Remedial Action - Final

5. Report Date 03/17/88

6.

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

13. Type of Report & Period Covered 800/000

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Old Bethpage landfill, covering approximately 65 acres, is located in Old Bethpage, Town of Oyster Bay, Nassau Country, New York. Two public drinking water wells, a residential community, an industrial park, and a state park, exist within the site's general vicinity. Beginning in 1958, the Town of Oyster Bay operated the landfill as a municipal landfill. In addition to accepting municipal wastes and garbage, local industrial wastes were disposed of on the landfill during the late 1960s and early 1970s. The landfill ceased operations in April 1986. A system designed to collect, store, treat, and dispose of leachate has been operating at the site since 1983. There are three remedial actions currently underway at the site. They include: leachate collection, methane gas collection, and landfill capping. The methane gas collection system was installed in phases in 1982 at the periphery of the site to monitor and prevent migration of gas beyond the property boundary. The 18-inch thick clay cap was applied to 29 acres of the landfill. These actions were described in the October 1983 Comprehensive Land Use and Operations Plan prepared in accordance with State landfill closure regulations. The primary contaminants of concern affecting ground water include: VOCs, TCE, benzene, toluene, inorganics, chromium, and lead. Air is contaminated with methane gas and VOCs.
(See Attached Sheet)

17. Document Analysis a. Descriptors
Record of Decision
Old Bethpage, NY
First Remedial Action - Final
Contaminated Media: gw, air
Key Contaminants: inorganics (chromium, lead), VOCs (benzene, TCE, toluene)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement

19. Security Class (This Report) None

20. Security Class (This Page) None

21. No. of Pages 257 2:4

22. Price

(See ANSI-Z39.18)

See Instructions on Reverse

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R02-88/058
March 1988

PB89-135362

EPA

Superfund Record of Decision:

Old Bethpage, NY

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NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA. 22161

EPA/ROD/R02-88/058
ld Bethpage, NY
irst Remedial Action - Final

16. ABSTRACT (continued)

The selected remedial action for this site includes: hydraulic control of the plume through installation of ground water recovery wells; ground water pump and treatment using air stripping and, if necessary, carbon filtration with discharge into an upgradient injection well system; ground water monitoring; completion of the landfill capping (29 acres previously capped); continuation and expansion, or enhancement of the leachate control and gas collection systems; and gas monitoring. The estimated present worth cost of this remedial action is $23,045,000.

Declaration Statement
Record of Decision

Old Bethpage Landfill

SITE NAME AND LOCATION

Old Bethpage Landfill, (the "Landfill") Old Bethpage, Town of Oyster Bay, Nassau County, New York

STATEMENT OF PURPOSE

This decision document sets forth the selected remedial action for the Old Bethpage Landfill developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 ("CERCLA"), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, published November 20, 1985.

STATEMENT OF BASIS

This decision is based upon the administrative record for the Old Bethpage Landfill. A copy of the record is available for review at the Plainview Public Library, 999 Old Country Road, Plainview, New York; and the New York State Department of Law, Environmental Protection Bureau, 120 Broadway, New York, New York. The documents, which are part of the administrative record, and which were primarily relied upon in making this decision are:

ATTENTION

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DOCUMENT COMPLETE AS PAGINATED PER SOURCE.

DIRECT QUESTIONS RESULTING FROM ILLEGIBILITY TO:

U.S. EPA
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- those documents listed in Attachment 1 to this Declaration;
- the Summary of Remedial Alternative Selection (Attachment 2 to this Declaration); and
- the Public Responsiveness Summary (Attachment 3 to this Declaration).

DESCRIPTION OF SELECTED REMEDY

The selected remedial alternative presented in this document in combination with remedial programs already implemented under various other federal and State regulations, including particularly 6 NYCRR Part 360 and those to be completed and monitored as part of the Remedial Action Plan ("RAP") (See Appendix I of ROD Attachment 2), will provide a complete and permanent solution for the release of hazardous substances at the site. The selected remedial alternative focuses on the control and clean-up of groundwater contamination emanating from the Landfill and source control of the Landfill by capping and gas control.

The major components of the selected remedy can be summarized as follows:

- Installation of a system of groundwater recovery wells located at the area defined by the leading edge of the plume of volatile organic chemicals and landfill leachate in excess of Applicable or Relevant and Appropriate Requirements (ARARs);
- Operation and maintenance of these groundwater recovery wells, to create a hydraulic barrier to attain ARARs (the specified groundwater criteria or zero slope condition as defined in the RAP);

- Treatment of the recovered water by an air stripper, and if necessary carbon filtration, in compliance with the ARARs for groundwater and air discharge.

The selected remedy in conjunction with the following remedial components already in place and/or to be completed includes:

- A leachate collection system operating at the landfill since late 1983. The system is designated to collect, store, treat, and dispose of the leachate generated by the landfill in compliance with ARARs;
- A gas collection system installed in phases since 1982. The system is designed to monitor and prevent migration of landfill gas beyond the property boundary in compliance with ARARs;
- Approximately 29 acres of the 65 acres landfill have already been capped. The remaining areas will be capped in compliance with ARARs.

In addition;

- Monitoring programs to determine the effectiveness and performance of each of these remedial system components;
- Post termination monitoring programs to insure continued compliance with ARAR's after remedial systems shutoff and to insure protection of human health and the environment.

The entire cost of remediating the landfill is estimated to be approximately $23 million.

DECLARATIONS

Consistent with the CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, the selected remedy in combination with the programs set forth in the RAP is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate for air and groundwater contamination at the site and is cost effective. As set forth in Section 121 of CERCLA, this remedy satisfies the statutory preference for remedies that employ as their principal element treatment which permanently and significantly reduces the toxicity, mobility and volume of hazardous substances. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. No federal Superfund monies are being used for this remediation.

This document constitutes a joint declaration of the State of New York and the United States Environmental Protection Agency.

March 14, 1988
Date

EDWARD O. SULLIVAN
Deputy Commissioner
Office of Environmental Remediation
New York State Department of Environmental Conservation

MARCH 17 1988
Date

CHRISTOPHER J. DAGGETT
Regional Administrator, Region II
United States Environmental Protection Agency

Vi

ROD ATTACHMENT 1

Old Bethpage Landfill Remediation

"Groundwater Monitoring Program: Phases 1 & 2," Lockwood, Kessler & Bartlett, June 1981.

"Comprehensive Land Use and Operations Plan, OBSWDC," Lockwood, Kessler & Bartlett, October 1983.

"Final Design Report OBSWDC Offsite Groundwater Investigation and Monitoring Program," Geraghty & Miller, March 1984.

"Phase 3 Groundwater Monitoring Program, 1983-1984, Analytical Results," Lockwood, Kessler, & Bartlett, May 1984.

"Phase 3 Groundwater Monitoring Program, 1984-85, Analytical Results" Lockwood, Kessler & Bartlett, June 1985.

New York State Sampling Data: "Offsite Monitoring Program", CompuChem, June 1985, July 1985, October 1985 and January 1986.

Raw Sampling Data, Eco Test Laboratories, June 1985, July 1985, October 1985, January 1986, and April 1986.

Remedial Investigation: "OBSWDC Offsite Exploratory Drilling and Monitoring Well Installation Program," Geraghty & Miller, August 1985.

Letter, dated July 25, 1986, from Owen Walsh (Nassau County) to Robert Osar (DOL) regarding Disposal of Treated Water.

Letter, dated July 30, 1986, from William Spitz (DEC) to E. Gail Suchman (DOL) regarding Long Island Water Supply Regulations and Nassau County Water Districts "CAPS" Letter.

Remedial Investigation: "OBSWDC Offsite Groundwater Monitoring Program," Geraghty & Miller, September 1986.

"1986 Annual Report: Summarizing the Status of Landfill Gas Monitoring Programs and the Establishment of the Zero Percent Gas Migration Limitation at the Old Bethpage Landfill," Lockwood, Kessler & Bartlett, April 1987.

"Remedial Action Feasibility Study: Landfill Leachate Plume, OBSWDC," Lockwood, Kessler & Bartlett/ Geraghty & Miller, July 1987.

Recent Quarterly Sampling Data, Eco Test Laboratories, September 1986 - July 1987.

"Air Stripping Design Report: Wells No. 6B, 6C, 6F," Hydro Group, Inc., July 1, 1987.

"Evaluation on Air Stripper Emission Impacts on Air Quality at the OBSWDC," RTP Environmental Association, September 1987.

"OBSWDC Aquifer Test for Evaluating Hydraulic Control of Leachate Impacted Groundwater," Geraghty & Miller, September 1987.

"Old Bethpage Landfill: Subsurface Gas Sampling,"Lockwood, Kessler & Bartlett, September 4, 1987 (draft).

Letter, dated September 8, 1987, from Geraghty & Miller to John Molloy (Holzmacher, McLendon & Murrell) regarding Potential Groundwater Mounding.

Letter, dated October 8, 1987, from RTP to John Lekstutis (Lockwood, Kessler & Bartlett) regarding the Assessment of Odor Potential for Proposed Air Stripping Tower (draft).

Letter, dated October 26, 1987, from Geraghty & Miller to Robert Osar (DOL) regarding Collection and Recharge Facilities calculations.

ROD ATTACHMENT 2

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
OLD BETHPAGE LANDFILL
OLD BETHPAGE, NEW YORK

I. BACKGROUND

A. Site, Location and Description

The Old Bethpage Landfill (the "Landfill") is located in Old Bethpage, Town of Oyster Bay, Nassau County, Long Island. The property on which the Landfill is located is bounded primarily by Winding Road and Round Swamp Road. The Landfill area is approximately sixty-five (65) acres.

There are two public drinking water well fields in the general vicinity of the Landfill, Plainview Well Field #5 to the north and two Farmingdale wells to the south-south east. There is a residential community to the northwest of the Landfill and an industrial park, including the Claremont Polychemical facilty, to the east. Bethpage State Park, which consists largely of a public golf course, is south, west and east of the Landfill. The Nassau County Fireman's Training Facility is south of the Landfill. See Map, Figure 1.

B. Site History

1. General

The Landfill has been operated by the Town of Oyster Bay (the "Town") as a municipal landfill since approximately 1958. In addition to municipal wastes and garbage, industrial wastes from local industries were also disposed in the Landfill in the late 1960's and early

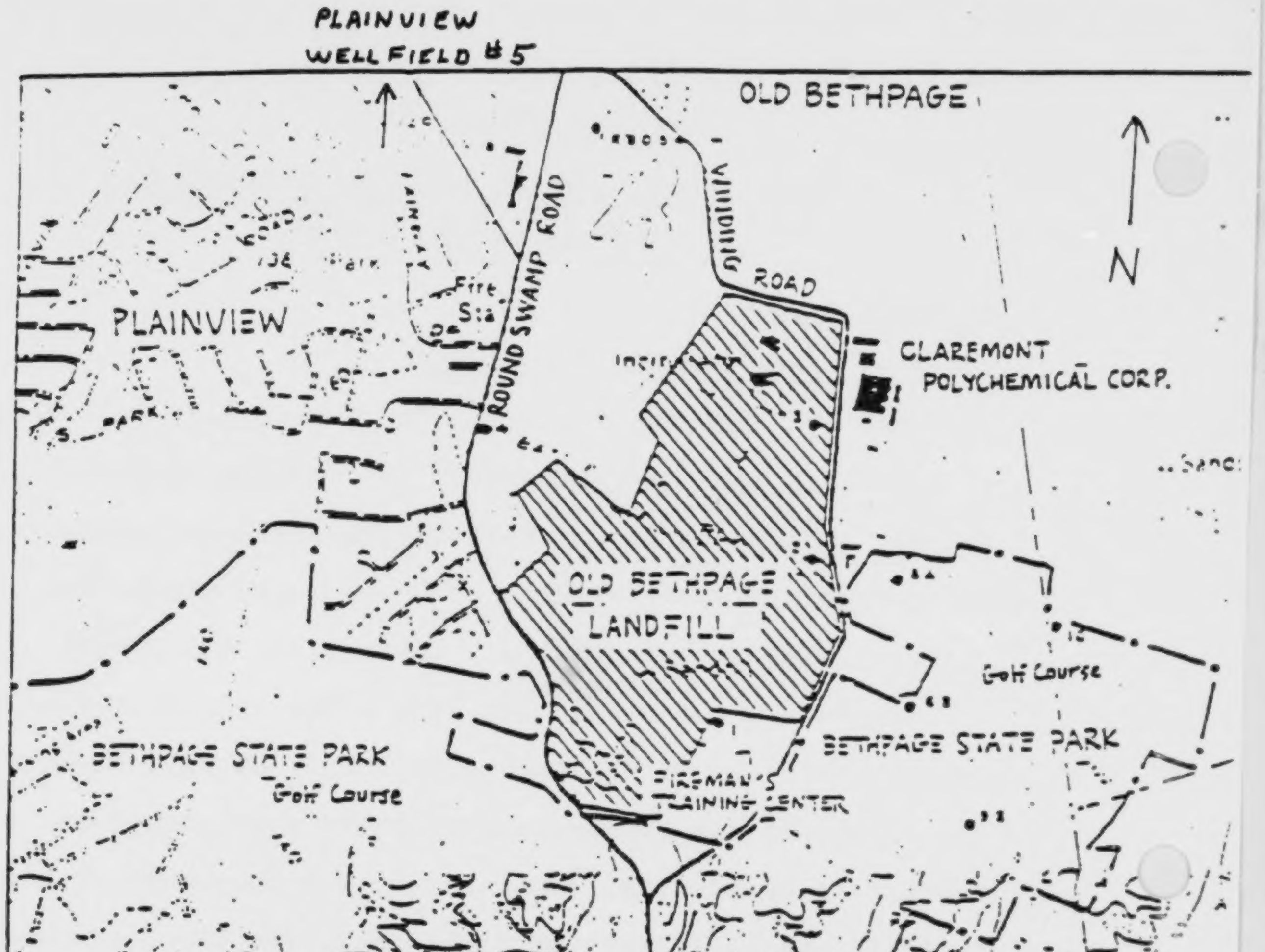
PLAINVIEW
WELL FIELD #5
OLD BETHPAGE
N
WINDING ROAD
ROUND SWAMP ROAD
PLAINVIEW
Fire Sta
CLAREMONT POLYCHEMICAL CORP.
OLD BETHPAGE LANDFILL
Golf Course
BETHPAGE STATE PARK
BETHPAGE STATE PARK
Golf Course
FIREMAN'S TRAINING CENTER
BETHPAGE STATE PARK
ROUND SWAMP ROAD
NASSAU CO.
SUFFOLK CO.
FARMINGDALE
WELL FIELD

Figure 1 MAP OF VICINITY OF OLD BETHPAGE LANDFILL

Reproduced from best available copy.

1970's. The Landfill was closed to further landfilling operations on April 14, 1986.

2. Early Data Gathering

(a) Groundwater

The investigation of groundwater contamination at and around the Landfill began in 1979. The initial programs were designed to determine the quality of the groundwater beneath the Landfill property. These were later expanded to include the monitoring of existing off-site wells to provide information on the effect of the Landfill on surrounding groundwater. These programs and their findings are discussed in detail in Lockwood, Kessler & Bartlett, Inc. (LKB) reports entitled: "Groundwater Monitoring Program, Phases 1 and 2", June 1981; "Phase 3 Groundwater Monitoring Program, 1983-1984 Analytical Results", May 1984; and "Phase 3 Groundwater Monitoring Program, 1984-1985 Analytical Results", June 1985. These reports are available for review in the administrative record.

As a result and based upon the groundwater data gathered under these programs, the later off-site groundwater investigation of the groundwater Remedial Investigation, set forth in Section I.B.7, infra, was implemented.

(b) Methane Gas

Methane gas migration was found both on and off of the Landfill site in the early 1980's. In response to this migration and the presence of methane gas in the Landfill, the methane gas collection remedial program described in Section I.B.4(b), infra, was implemented.

3. Listing on the NPL.

On September 8, 1983 this site was listed on the National Priorities List (NPL) [see 48 Fed. Reg. 40658].

4. History of Remedial Activity

There are three remedial actions currently completed or underway at the Old Bethpage Landfill. These are: leachate collection, methane gas collection, and Landfill capping. These actions are fully described in the October 1983 LKB report entitled "Comprehensive Land Use and Operations Plan", prepared in accordance with the landfill closure regulations found at 6 NYCRR Part 360 and appropriate guidelines. That plan was approved by the New York State Department of Environmental Conservation ("DEC"). The programs were designed to significantly limit migration of contaminants from the Landfill via air emissions and surface runoff. In addition, the capping program was designed to reduce infiltration into the Landfill, thereby reducing leachate production and subsequent groundwater contamination. The three programs are described below:

(a) Leachate Collection

A leachate control system has been operating at the Landfill since late 1983. The system is designed to collect, store, treat and dispose of leachate generated by the Landfill. Collection wells and an underdrain system have been installed over the lined portion of the Landfill (approximately 12 acres). Leachate flows from these collection points to a clay and polyethylene lined temporary storage basin. The leachate is then treated by standard metals precipitation and solids separation techniques. The treated effluent is discharged into the Nassau County sewage treatment system in accordance with the requirements of the State Pollution Discharge Elimination System (SPDES) and Nassau County Ordinances. The sludge is currently dewatered and returned to the Landfill. This program is described in detail in Section 4 of the 1983 "Comprehensive Land Use and Operations Plan."

Provisions for the future maintenance and operation of the leachate control system are set forth in Section I.I. of the Remedial Action Plan ("RAP"), attached hereto as Appendix I. Under the RAP, the sludge will be disposed off-site at an approved waste disposal facility.

The capacity of the leachate collection system is 50,000 gallons/day. The amount of leachate produced is approximately 150,000 gallons/week. The leachate is and will continue to be monitored monthly for metals, sulfites and total suspended solids, until such time as leachate production ceases at the Landfill.

(b) Landfill Gas Collection

The Landfill gas collection system has been installed in phases at the periphery of the Landfill since 1982. The system is designed to monitor and prevent migration of Landfill gas beyond the property boundary. Approximately seventy sampling points around the Landfill are monitored monthly for the presence of methane. When monitoring has indicated that Landfill gas was migrating beyond the collection system at any point, the system has been expanded to address that migration. The RAP calls for the continued expansion and enchancement of that system, as required, according to the results of future monitoring data.

In 1982, Phase I of the collection system was installed in the vicinity of the Nassau County Fireman's Training Center at the southeastern corner of the Landfill. The system consisted of a series of extraction wells and blowers which collected gas and vented it into the atmosphere in uninhabited areas surrounding the Landfill. In 1984, Phase II extended the collection system along the eastern border of the Landfill at Winding Road. The original design of Phases I and II and the monitoring program is fully described in Section 6 of the 1983 "Comprehensive Land Use and Operation Plan". In 1986, an incinerator was installed to incinerate the extracted gases from Phases I and II in lieu of venting. Phase III, at the northwest boundary of the Landfill, became operational in 1987. A map depicting the gas collection program is shown in Figure 2.

Data collected through the gas monitoring program is compiled into published annual reports. The most recent report available is the "1986 Annual Report: Summarizing the Status of Landfill Gas Monitoring Programs and the Establishment of the Zero Percent Gas Migration Limitation at the Old Bethpage Landfill" released by LKB in April 1987. The monitoring program has been revised as required since 1982 and will be expanded and carried out in the future as per Section I.H. of the RAP.

Subsurface gas sampling was conducted in September, 1987 to help design a more comprehensive gas monitoring program. The results of that sampling program are set forth in a draft report entitled "Old Bethpage Landfill: Subsurface Gas Sampling". The monitoring program in the RAP is designed to measure the continued effectiveness and efficiency of the gas collection system.

In addition to the gas collection system at the site perimeter, there is a gas extraction system in the center of the Landfill which is privately operated under license from the Town. The system extracts gas for the generation of approximately 3 megawatts of electricity. It is estimated by the Town that this process will produce gas sufficient for 10 to 15 years of continued generation and that at that point in time the level of gas in the Landfill will approach zero.

OLD BETHPAGE LANDFILL GAS COLLECTION SYSTEM

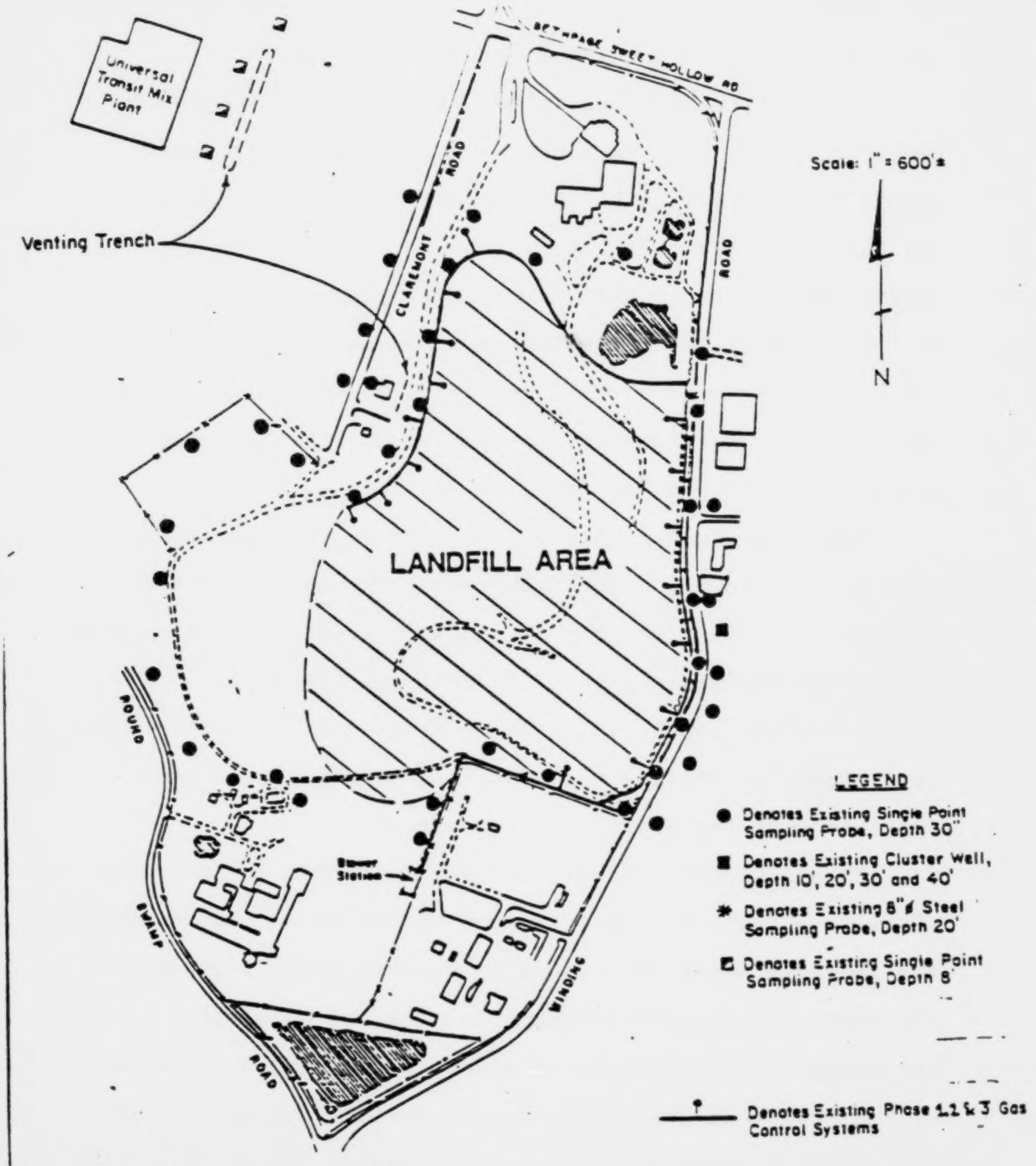
Universal Transit Mix Plant
Venting Trench
BETHPAGE SWEET HOLLOW RD
CLAREMONT ROAD
ROAD
Scale: 1" = 600'±
N
LANDFILL AREA
ROUND SWAMP ROAD
Blower Station
WINDING
LEGEND
● Denotes Existing Single Point Sampling Probe, Depth 30"
■ Denotes Existing Cluster Well, Depth 10', 20', 30' and 40'
✱ Denotes Existing 8"ø Steel Sampling Probe, Depth 20'
◪ Denotes Existing Single Point Sampling Probe, Depth 8'
Denotes Existing Phase 1,2 & 3 Gas Control Systems

FIGURE 2

April 1987

LKB LOCKWOOD, KESSLER & BARTLETT, INC.

-6-a

(c) Capping

Closure and capping of the Landfill is required pursuant to 6 NYCRR Part 360. The capping process involves regrading the slopes of the Landfill to a slope of 3 horizontal to 1 vertical. An 18-inch thick clay cap or equivalent material with a permeability of 10^{-7} or less will then be placed over the Landfill to limit infiltration into the fill. It is presently contemplated that a 12-inch soil cover will be placed on the cap and the area will be revegetated. The design and specifications of the cap are described in Appendix I, Section I.G. At the present time, a cap has been applied to approximately 29 acres of the 65 acre Landfill. The capping program is proceeding and will be completed in conjunction with the groundwater remediation program selected herein.

The requirements and schedule for completion of the capping program are set forth in Section I.K. of the RAP. A compliance monitoring program for the cap is set forth in Section I.G. of the RAP.

5. Enforcement History

(a) Inter-Agency Coordination

On July 23, 1982, DEC referred the investigation and remediation of the Old Bethpage Landfill to the New York State Department of Law ("DOL") for enforcement. An initial meeting to establish coordination with the United States Environmental Protection Agency ("EPA") was held on

September 9, 1982. The Attorney General's office was named lead enforcement agency on the matter. The Attorney General's office commenced negotiations for an off-site groundwater investigation during the fall of 1982. Initial discussions were held with the Town and also with identified corporate responsible parties: Occidental Petroleum (formerly Hooker Chemicals and Plastics), Grumman Aerospace, and Cerro Wire and Cable. More detailed negotiations with the Town were held during 1983.

(b) Litigation

(i) History

On December 9, 1983 the Attorney General's office filed a summons and complaint in the United States District Court for the Eastern District of New York against the Town of Oyster Bay; Occidental Chemical Corporation; Occidental Chemical Holding Corporation; Occidental Petroleum Corporation; Marmon Group, Inc.; Cerro Wire & Cable Corp.; Cerro Conduit Company; Cerock Wire and Cable Group, Inc.; The Rockbestos Company; Grumman Corporation; and Grumman Aerospace Corporation.

The complaint was brought under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 as well as pendant state claims under State statute and the common law. The defendants served answers. There was some informal discovery conducted.

The Town signed an Interim Consent Decree in May 1984, which required it to complete some remedial activities then underway [i.e., a portion of the capping program (29 acres) and the completion and continued operation and maintenance of the gas collection program] and to perform the off-site groundwater investigation detailed therein. The purpose of the off-site groundwater investigation was to identify the plume of chemical contamination emanating from the Old Bethpage Landfill. The results of the off-site groundwater investigation are set forth in the Geraghty & Miller, Inc. (G&M) reports entitled "OBSWDC Offsite Exploratory Drilling and Monitoring Well Installation Program, Old Bethpage, Long Island, New York," (August 1985) and "OBSWDC Offsite Groundwater Monitoring Program, Old Bethpage, Long Island, New York," (September 1986). These documents constitute the Remedial Investigation ("RI") for this site. The details of the RI are set forth in Section I.B.7 herein. The Town also committed as part of that Interim Consent Decree to prepare a Remedial Action Feasibility Study ("FS"). The Interim Consent Decree was approved by the court on July 19, 1984.

While the RI was being conducted by the Town, the Town and the other defendants reviewed records of the Town and identified approximately 160 other parties who were alleged by them to be responsible parties with respect to contaminant releases from the Landfill. On or about October 4, 1985 and January 9, 1986, the Town and the other defendants brought third-party actions against these 160 parties.

(ii) Current Status

As the FS was being developed, negotiations were conducted among all the parties and third-parties to determine the possibility of resolving this action by settlement. The parties developed the terms of a proposed settlement. Final agreement to that proposed settlement is contingent upon the final selection of remedy by the State and EPA through the Record of Decision ("ROD") process and agreement by the State and Town to the attached Remedial Action Plan ("RAP"), Appendix I. Once these items are resolved, a consent decree setting forth that settlement can be executed by the parties.

6. Risk Assessment

A qualitative risk assessment was conducted to evaluate the risk to public health and the environment associated with the Old Bethpage Landfill. The risk assessment consisted of the following: identification of contaminants of concern; description of potential pathways and populations of exposure associated with site contaminants; and determination of the best means to remove potential risks to humans and the environment.

(a) Contaminants of Concern

The primary contaminants of concern identified in the early data gathering were methane gas and variety of volatile organic compounds in the groundwater. It was determined that due to the high concentration of these contaminants found on-site, they were probably moving off-site. The methane gas collection system had already been commenced to prevent further off-site migration of landfill gas. Partial Landfill capping provided some interim remediation for groundwater contaminant migration. A full off-site groundwater investigation was deemed necessary.

The various chemicals found on-site cause a variety of adverse health effects, depending on the type of chemical and the concentrations found. Some of the chemicals found were known or suspected human carcinogens, including vinyl chloride and benzene.

(b) Exposure Pathways/Population

It was determined that the Landfill presented two primary exposure routes: 1) landfill gas migration and 2) potential off-site migration of contaminated groundwater. There were two primary populations potentially exposed: 1) the residential neighborhoods close to the Landfill (air exposure) and the residents of the Village of Farmingdale who utilize the public drinking wells directly downgradient of the Landfill (contaminated groundwater exposure). In order to insure that these populations were protected, the remedial investigation, feasibility study, and interim measures set forth in the Interim Consent Decree called for plans designed to measure the extent of those exposure routes and to provide for their complete and permanent closure.

(c) Risk Characterization

The investigation and studies set forth herein identified and defined the air and groundwater exposure pathways emanating from the Landfill. The list of contaminants found and their concentrations are set forth in the data packages in the administrative record. The investigation and studies show that the potentially exposed populations are not currently being impacted through these routes of exposure. The RAP, attached hereto, sets forth a remedial plan designed to control the source of contamination (the Landfill) and to control the paths of population exposure to air and groundwater contaminants. The remedial plans call for the eventual reduction of the contamination within the areas of containment to concentrations at or below health based cleanliness standards and guidelines. The plan also calls for the comprehensive monitoring of all remedial systems to evaluate their continued effectiveness in limiting the routes of exposure and in cleaning up the contaminant concentrations.

The successful implementation and completion of the RAP and compliance with the proposed Consent Decree cited above will reduce the potential risks to humans and the environment presented by these paths of exposure in compliance with the cleanliness requirements discussed herein.

7. Remedial Investigation ("RI")

The purpose of the groundwater investigation was to delineate and characterize the leachate plume emanating from the Landfill. The investigation included the drilling of six exploratory borings and the installation of 23 monitoring wells in Bethpage State Park. The drilling and monitoring well installation program was completed in April 1985 when the Town and State agreed that the extent of the Landfill leachate plume had been defined. Inorganic chemical parameters, typical of sanitary landfill leachate, were used to define the extent of the plume. The methodology used to define the extent of the leachate plume is discussed further in the G&M Report of August 1985.

After completion of the well installation phase, five rounds of water quality samples were collected (June, July, October 1985 and January, April 1986) from the 23 monitoring wells and other selected wells. This data is set forth in the administrative record and is available for review. Groundwater samples were analyzed for an extensive list of parameters that included metals and organic compounds. In addition, water level measurements and water quality samples were taken in three temporary wells upgradient of the Landfill to determine if there were any effects from groundwater mounding.

Water-level data from off-site wells clearly demonstrated that groundwater flow under the Landfill is to the south-southeast. Water-level data collected from the three temporary upgradient wells did not indicate components of groundwater flow (mounding) to the north or west. (See G&M Report, August 1985)

The approximate lateral extent of the Landfill leachate plume (at three depths) is shown on Figure 3. The plume exhibits the greatest lateral extent at the middle depth, extending approximately 2000 feet from the Landfill. The approximate vertical extent of the Landfill leachate plume is shown on Figure 4. The thickest section of the plume is approximately 200 feet. Further discussion on the configuration of the plume is provided in G&M's September, 1986 groundwater report, cited earlier.

Results of the five rounds of groundwater sampling of the 23 off-site monitoring wells indicate that the Landfill leachate plume is comprised of inorganic compounds and volatile organic compounds (halogenated and non-halogenated) (VOCs). The data generated from these sampling efforts is contained and discussed in the G&M report of September 1986. The lateral and vertical extent of the VOC and Landfill leachate plume in excess of Applicable or Relevant and Appropriate Requirements (ARARs) (see Table 1) is shown in Figures 5 and 6, respectively (hereinafter referred to as the "plume").

The most dominant halogenated organics, in terms of concentration and distribution, are 1,2-dichloroethene, 1,1-dichloroethane, vinyl chloride, methylene chloride, trichloroethene and chloroethane. The non-halogenated organic compounds occur in a smaller area of the plume than the halogenated compounds. The most dominant compounds of

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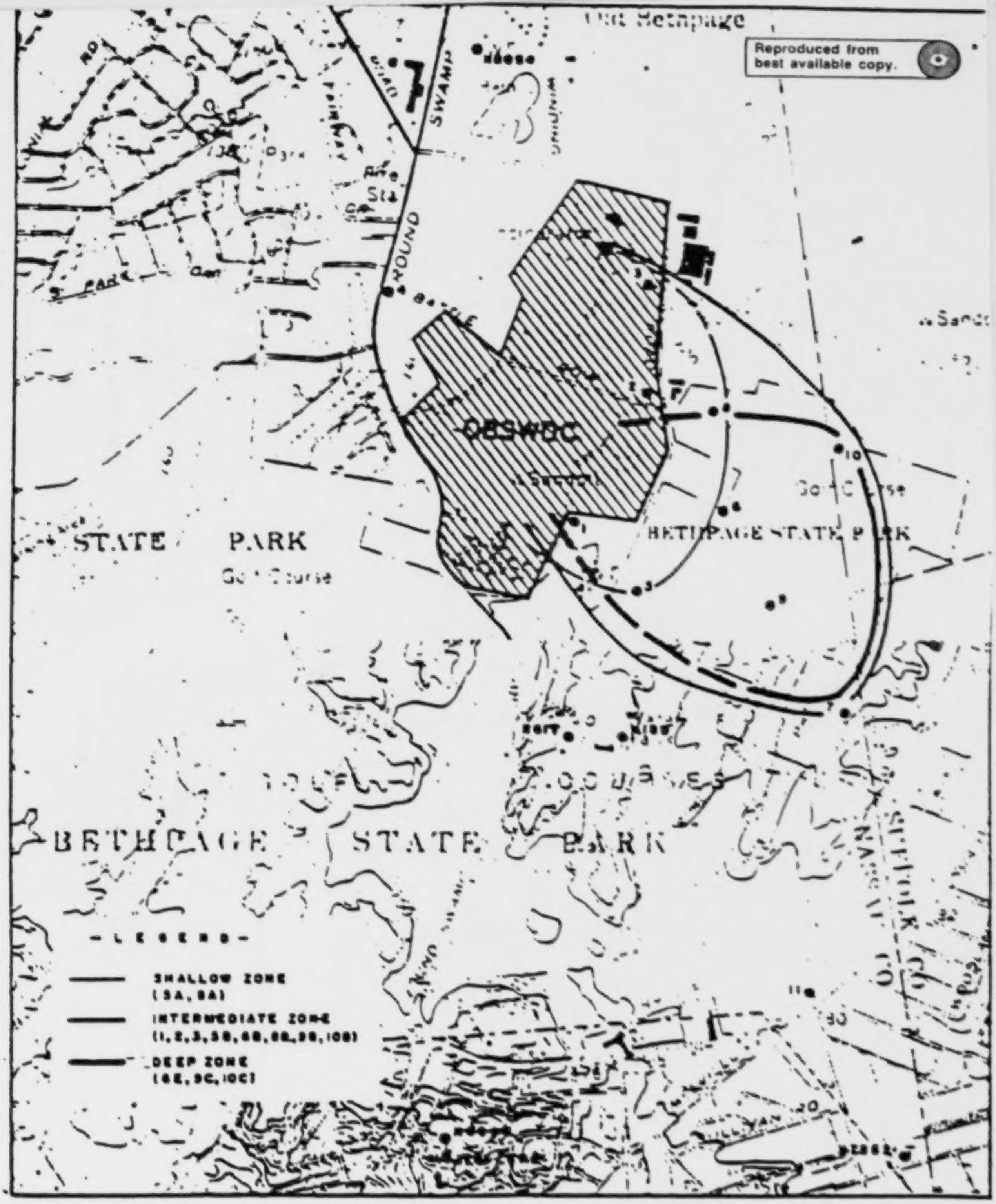
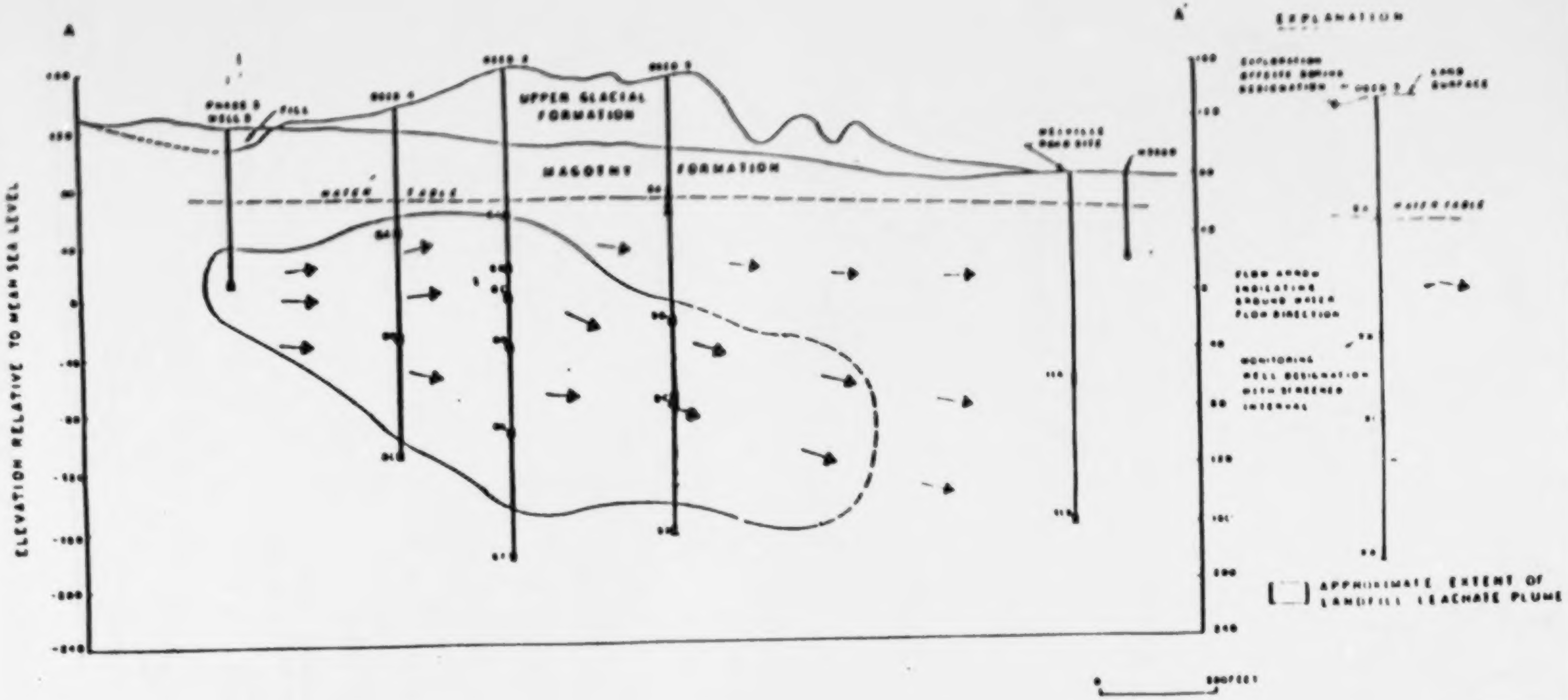

Old Bethpage
ROUND SWAMP
Rifle Sta
BATTLE
OBSWDC
Sands
Golf Course
STATE PARK
Golf Course
BETHPAGE STATE PARK
BETHPAGE STATE PARK
NASSAU CO
SUFFOLK CO
- L E G E N D -
SHALLOW ZONE (5A, 8A)
INTERMEDIATE ZONE (1, 2, 3, 5B, 6B, 8B, 9B, 10B)
DEEP ZONE (6E, 9C, 10C)

Figure 3 APPROXIMATE EXTENT OF LANDFILL LEACHATE PLUME WITHIN 3 HYDROGEOLOGIC ZONES

PREPARED BY GERAGHTY & MILLER, INC., FOR LOCKWOOD, KESSLER, & BARTLETT, INC., & TOWN OF OYSTER BAY, OLD BETHPAGE, NY



A
A'
ELEVATION RELATIVE TO MEAN SEA LEVEL
PHASE 3 WELL 8
FILL
UPPER GLACIAL FORMATION
MAGOTHY FORMATION
WATER TABLE
EXPLANATION
LAND SURFACE
WATER TABLE
FLOW ARROW INDICATING GROUND WATER FLOW DIRECTION
MONITORING WELL DESIGNATION WITH SCREENED INTERVAL
APPROXIMATE EXTENT OF LANDFILL LEACHATE PLUME

Prepared by Geraghty & Miller, Inc for

APPROXIMATE VERTICAL EXTENT
OF LANDFILL LEACHATE PLUME
ALONG CROSS SECTION A-A'

LOCKWOOD, KESSLER, AND BARTLETT, INC
AND THE
TOWN OF OYSTER BAY

Old Bethpage, New York

FIGURE 4

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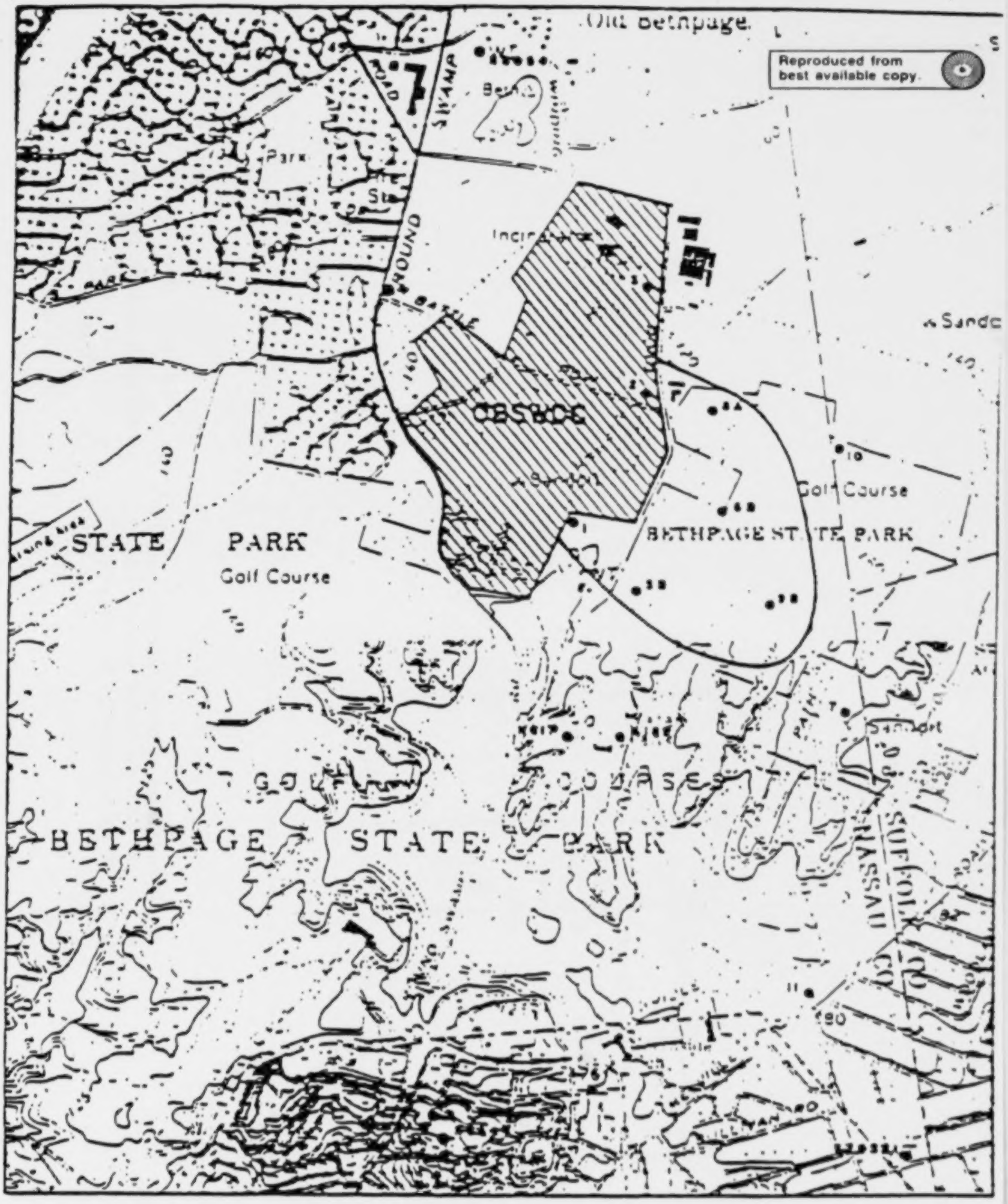
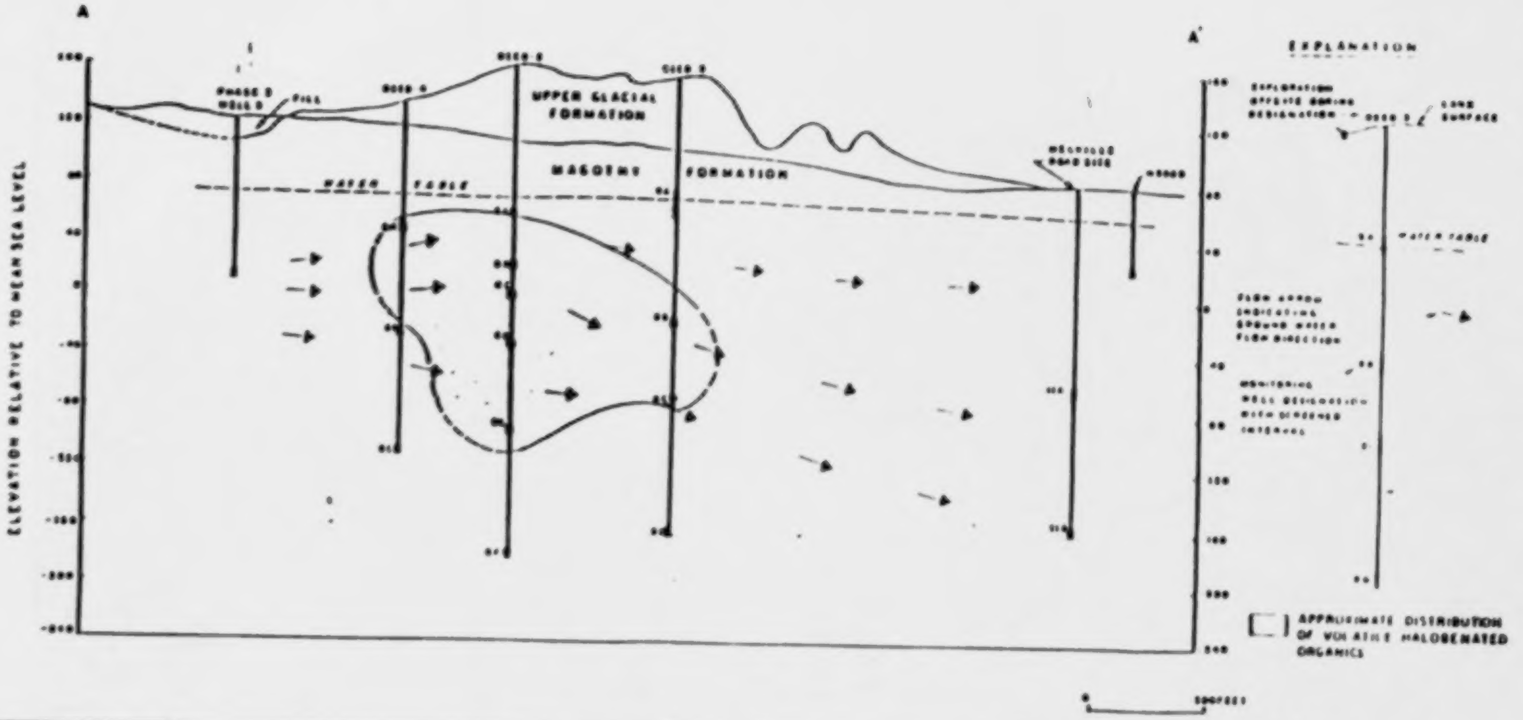

Old Bethpage
Park
SWAMP
ROAD
ROUND
BATTLE
Incinerator
Sandc
STATE PARK
Golf Course
Golf Course
BETHPAGE STATE PARK
GOLF COURSES
BETHPAGE STATE PARK
NASSAU
SUFFOLK

Figure 5 APPROXIMATE DISTRIBUTION OF VOLATILE HALOGENATED ORGANICS (VHOs) AND LANDFILL LEACHATE IN EXCESS OF ARAR's

PREPARED BY GERAGHTY & MILLER INC., FOR LOCKWOOD, KESSLER, & BARTLETT, INC., & TOWN OF OYSTER BAY, OLD BETHPAGE, NY


A
A'
ELEVATION RELATIVE TO MEAN SEA LEVEL
PHASE II WELL 9
FILL
UPPER GLACIAL FORMATION
MAGOTHY FORMATION
WATER TABLE
EXPLANATION
EXPLORATION AFFECTS BORING DESIGNATION
LAND SURFACE
WATER TABLE
FLOW ARROW INDICATING GROUND WATER FLOW DIRECTION
MONITORING WELL DESIGNATION WITH SCREENED INTERVAL
APPROXIMATE DISTRIBUTION OF VOLATILE HALOGENATED ORGANICS
0
500 FEET

APPROXIMATE VERTICAL DISTRIBUTION OF VOLATILE HALOGENATED ORGANICS (VHOs) ALONG CROSS SECTION A-A'

Prepared by Geraghty & Miller, Inc. for

LOCKWOOD, KESSLER, AND BARTLETT, INC.
AND THE
TOWN OF OYSTER BAY

Old Bethpage, New York

Figure 6

this group are benzene, toluene, ethylbenzene and isomers of xylene. Tetrachloroethene, although present at similar concentrations, has a different lateral distribution than the compounds cited above. In this regard, comparison of the distributions of the different VOC groupings within the Landfill leachate plume indicates that part of the VOC contamination may not be attributable to the Landfill. This finding is discussed in the G&M report of September 1986, cited above.

Results of groundwater sampling of the three temporary wells upgradient of the Landfill indicate that no significant mounding is occuring at the Landfill. In addition, the proposed final capping of the Landfill as set forth in the RAP will minimize any future potential for contaminant migration due to mounding.

Investigation and regular sampling by Nassau County of Farmingdale and Plainview public drinking water has shown that the contamination from the Landfill is not affecting those public drinking wells at this time.

8. Supplemental Investigation

(a) Effectiveness of Gas Collection System

The effectiveness of the gas collection system installed at the Landfill is monitored on a monthly basis as described in Section I.B.4(b), supra. Annual reports have been prepared summarizing the results of the data collected. The most recent annual report, for 1986 (cited earlier), demonstrated the effectiveness of the gas collection system for controlling methane gas migration beyond the boundary of the Landfill. A supplemental sampling program was undertaken in June 1987 to confirm that the system effectively prevented the escape of gases other than methane from the Landfill.

The supplemetal gas sampling program consisted primarily of 1) the collection of subsurface gas samples from a depth of 30 inches below the surface at eight locations around the perimeter of the collection system, 2) the collection of subsurface gas samples at depths of 10, 20, 30 and 40 feet from one deep well cluster outside the gas collection system, and 3) the collection of two ambient air samples beyond the collection system. The samples were analyzed for volatile organic compounds (VOC).

The results of this sampling effort are summarized in the September 1987 draft report entitled, "Old Bethpage Landfill: Subsurface Gas Sampling" previously cited and available for review. Minimal levels of VOCs were found in some of the gas samples. The data demonstrated that the collection system is effective for controlling volatile organic compounds as well as methane. However, the data also demonstrated the need for further monitoring for potential migration of small amounts of landfill gas containing VOCs.

In light of these results, a continuing VOC sampling program to supplement the current methane gas monitoring program was designed and set forth in the RAP at Section I.H.

This supplemental program will consist of: 1) the collection of subsurface gas samples from a depth of 30 inches at 14 locations around the perimeter of the collection system; 2) the collection of subsurface gas samples at depths of 10, 20, 30 and 40 feet from one deep well cluster beyond the collection system; 3) the collection of ambient air samples at three locations around the Landfill; 4) the collection of thermal oxidizer emission samples (stack testing in the incinerator stack); and 5) the taking of pressure readings to ascertain whether a vaccuum is created by the collection system. The sampling will be performed on a quarterly basis during the initial year of the program and, if approved by the State, on an annual basis thereafter. This data will assist in monitoring the continued effectiveness of the gas collection system and in determining whether the system needs adjustment or enchancement.

(b) Projected Effects of Remediation

As described infra, once the RI was completed, an evaluation of remedial alternatives began for development of the FS. As different site-appropriate alternatives were conceptualized, it became necessary to investigate the potential environmental impacts associated with those remedial alternatives. In particular, the remedial alternatives which utilize the elements of groundwater recovery, treatment and recharge into the aquifer (more fully described below in Section II.D.2), presented questions with respect to potential local impacts. The areas of concern were: 1) the potential mounding effects due to recharge of large amounts of water into the aquifer at one location; 2) the effectiveness of the treatment system (in this case air stripping, described in Section II.D.2) in attaining the water quality requirements mandated by ARARs and contained in the RAP; and 3) the air quality impacts associated with air stripping. The first and third items above were also of concern to the public as discussed in the Public Responsiveness Summary attached hereto.

(i) Mounding Effects of Recharge

The Town's groundwater consultant, Geraghty & Miller, prepared mounding calculations which demonstrated that the recharge of 1.5 MGD of groundwater into the aquifer at the water table would have no impact on the groundwater beyond a point which is, at a maximum, 1300 feet upgradient of the recharge, i.e., the stagnation point. Furthermore, they found that the effects of the recharge would occur in the shallow portion of the aquifer. The calculations performed are described in a letter dated September 8, 1987 from G&M to Mr. John Molloy of Holtzmacher, McLendon & Murrell, contained in the administrative record. These calculations, as well as calculations demonstrating the area of the aquifer influenced by the proposed groundwater recovery wells, were used in determining appropriate locations for groundwater recharge in the various remedial alternatives evaluated.

(ii) Quality of Water Treated By Air Stripping

A pilot test was conducted in July 1987 to demonstrate the potential effectiveness of air stripping for the treatment of the groundwater. A portable air stripping tower was used for the pilot test as described in a report dated July 1, 1987 prepared by Hydro Group, Inc., entitled "Air Stripping Design Report."

The test was conducted by pumping water from the most heavily contaminated monitoring well in the plume to the pilot air stripper for treatment. Both influent and effluent water was sampled for VOCs. Results of the test indicated a potential removal efficiency of 98.98% for benzene (used as the indicator for all VOCs), thereby demonstrating the remedial effectiveness of air stripping. Continued monitoring of the water quality of discharge from the treatment unit will be required as part of the comprehensive remedial program.

(iii) Quality of the Air Discharged by the Treatment Unit

A modeling study was performed to evaluate the potential impacts of emissions from an air stripper, located at the Landfill, on air quality in the neighborhood abutting the Landfill. The modeling procedures and results are presented in a September 1987 draft report entitled, "Evaluation of Air Stripper Emission Impacts on Air Quality at the Oyster Bay Solid Waste Disposal Complex", prepared by

RTP Environmental Associates and made part of the administrative record. The results indicate that, under worst case conditions, air discharge from the air stripper will fall well below ARARs and that the maximum impact of these emissions will occur within the boundaries of the Landfill property. There will be no significant impact on the abutting communities.

(iv) Odor Study

Subsequent to the air modeling study, RTP conducted an odor threshold analysis for the projected air stripper emissions to confirm there would be no odor problem offsite of the Landfill, if the treatment facility was located on Landfill property. The results of the analysis are presented in a letter report prepared by RTP on October 8, 1987, entitled, "Preliminary Assessment of Odor Potential for Proposed Air Stripping Tower."

RTP compared peak short term emissions at the Landfill boundary to recognized odor thresholds for a number of chemical compounds existing in the Landfill plume. The study demonstrated that no odor thresholds were exceeded beyond the Landfill boundary. The study concluded that at the low contaminant concentrations to be emitted by the air stripper, no odors would be detectable offsite.

Despite these copacetic results, continued monitoring of the quality of the treated water and the operating conditions of the stripper will be required to assure continued protection of air quality in the vicinity of the Landfill.

II. REMEDIAL ALTERNATIVES EVALUATION

A. Process

The remedial alternatives for the Old Bethpage Landfill Site were developed and evaluated using as guidance the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR §300.68, and the EPA "Guidance on Feasibility Studies Under CERCLA".

The major objective of the Old Bethpage Feasibility Study ("FS") was to evaluate remedial alternatives using a cost-effective approach consistent with the goals and objectives of CERCLA. According to Section 121 of CERCLA, the recommended remedial alternative should protect human health and the environment, should be cost-effective, and should utilize permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. The proposed remedy must also attain the ARARs that have been identified for the site on Table 1. Section 300.68(e) of the NCP outlines procedures and criteria which are used in selecting the most cost-effective alternative.

TABLE 1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS IDENTIFIED FOR THE OLD BETHPAGE LANDFILL (ARARs)

I. GROUNDWATER AQUIFER AND TREATED GROUNDWATER DISCHARGE REQUIREMENTS*

Inorganics	mg/l
Barium	1.0
Cadmium	0.01
Chloride	250
Chromium (hex)	0.05
Copper	1.0
Cyanide	0.2
Iron	0.3
Lead	0.025
Magnesium	35
Mangenese	0.3
Mercury	0.002
Silver	0.05
Zinc	5.0
Total Dissolved Solids	500**
Nitrate	10
Sulfate	250
Phenols (total)	0.001
Volatile Organic Compounds (VOCs)	**ug/l**
Vinyl Chloride	2.0***
Methylene Chloride	50
1, 1 Dichloroethane	50
1, 2 Dichloroethane	0.8
1, 1 Dichloroethene	0.07
1, 2 Dichloroethene (trans)	50
Trichloroethylene	5.0***
1, 1, 1 Trichloroethane	50
Chloroform	100
Carbon Tetrachloride	5
1, 2 Dichloropropane	50
Bromodichloromethane	50
Tetrachloroethene	0.7
Chlorodibromomethane	50****
Chloroethane	50****
Bromoform	50
Benzene	non-detect
Toluene	50
Xylene (all isomers)	50

Table 1 con't.

Ethylbenzene	50
Chlorobenzene	20
Dichlorobenzene	
ortho-and para-	4.7
all isomers	50****
Total VOCs (for groundwater)	50
Total VOCs (for discharge)	100

* This list of compounds is not exhaustive of the applicable Standards and Guidance Values. The list represents the most prevalent compounds found at the site. The cleanliness criteria listed herein are Standards and Guidance Values issued by the NYS Department of Environmental Conservation for the protection of Class GA waters found at 6 NYCRR 703 and in the Technical and Operational Guidance Series (TOGs) dated April 1, 1987. If during the course of the remediation additional compounds should be detected, the most stringent of the requirements obtained from these two sources shall apply. For any VOC which does not have a specific Standard or Guidance Value, the applicable limit shall be 50 u/l.

** Federal Standard promulated by the U.S. Environmental Protection Agency (EPA).

*** For these compounds, the Maximum Contaminant Level (MCL) under the Federal Safe Drinking Water Act is less than the State Standards or Guidance Values and therefore shall apply. Should additional MCLs be promulgated by the EPA, then the most stringent standard shall apply.

**** These compounds do not have a specific State Standard or Guidance Value and therefore the applicable limit is 50 u/l.

II. AIR DISCHARGE REQUIREMENTS

Constituent	Ambient Air Concentrations NYSDEC Annual Guideline* (ug/m3)
Vinyl Chloride	4.00E-01
Freon 13	3.00E-02
Methylene Chloride	1.17E+03
1,1-Dichlorcethane	2.70E+03
1,2-Dichloroethene	2.63E-03
Chloroform	1.67E+02
1,1,1,-Trichloroethane	3.80E+04

Table 1 con't.

Ethylbenzene	50
Chlorobenzene	20
Dichlorobenzene	
ortho-and para-	4.7
all isomers	50****
Total VOCs (for groundwater)	50
Total VOCs (for discharge)	100

*   This list of compounds is not exhaustive of the applicable Standards and Guidance Values. The list represents the most prevalent compounds found at the site. The cleanliness criteria listed herein are Standards and Guidance Values issued by the NYS Department of Environmental Conservation for the protection of Class GA waters found at 6 NYCRR 703 and in the Technical and Operational Guidance Series (TOGs) dated April 1, 1987. If during the course of the remediation additional compounds should be detected, the most stringent of the requirements obtained from these two sources shall apply. For any VOC which does not have a specific Standard or Guidance Value, the applicable limit shall be 50 u/l.

**   Federal Standard promulgated by the U.S. Environmental Protection Agency (EPA).

*** For these compounds, the Maximum Contaminant Level (MCL) under the Federal Safe Drinking Water Act is less than the State Standards or Guidance Values and therefore shall apply. Should additional MCLs be promulgated by the EPA, then the most stringent standard shall apply.

**** These compounds do not have a specific State Standard or Guidance Value and therefore the applicable limit is 50 u/l.

II. AIR DISCHARGE REQUIREMENTS

Constituent	Ambient Air Concentrations NYSDEC Annual Guideline* (ug/m3)
Vinyl Chloride	4.00E-01
Freon 13	3.00E-02
Methylene Chloride	1.17E+03
1,1-Dichloroethane	2.70E+03
1,2-Dichloroethene	2.63E+03
Chloroform	1.67E+02
1,1,1,-Trichloroethane	3.80E+04

Table 1 con't.

Carbon Tetrachloride	1.00E+02
1,2-Dichloroethane	2.00E+01
Trichloroethylene	9.00E+02
1,2,-Dichloropropane	1.17E+03
Bromodichloromethane	3.00E-02
Tetrachloroethene	1.12E+03
Chlorodibromomethane	3.00E-02
Bromoform	1.67E+01
Benzene	1.00E+02
Toluene	7.50E+03
Ethyl Benzene	1.45E+03
(m) Xylene	1.45E+03
(o&p) Xylene	1.45E+03
(m) Dichlorobenzene	3.00E-02
(o) Dichlorobenzene	1.00E+03
(p) Dichlorobenzene	1.50E+03
Chloroethane	5.20E+04
1,1,-Dichloroethylene	6.67E+01
Chlorobenzene	1.17E+03
Ammonia	3.60E+02

* Establish per NYS Department of Environmental Conservation Air Guide No. 1 for Control of Toxic Ambient Air Contaminants. If any federal National Ambient Air Quality Standards or National Emission Standards for Hazardous Air Pollutants are promulgated which are more stringent than these State guidelines, the more stringent standard shall apply.

III. METHANE GAS CONTAINMENT REQUIREMENTS

- 6 NYCRR Part 360
- Zero Percent Methane Gas Migration Limitation Measured at Landfill Boundary
- Condensate Treatment in Compliance with SPDES or other applicable treatment regulation.

IV. LANDFILL CAP REQUIREMENTS

- 6 NYCRR Part 360
- Capping Cover Material Equivalent to 18 inches of Clay at Hydraulic Conductivity of 10^{-7} centimeters per second or less
- 12 inches top soil hydroseeded
- Side Slopes 3 to 1 or less as long as a stable side slope is maintained

V. LEACHATE CONTROL REQUIREMENTS

- 6 NYCRR Part 360
- Sludge disposed of in licensed disposal facility
- Effluent disposed of per County Ordinances

A five step process was developed and used to meet the FS objectives. The following is a summary of that process.

The first step was to evaluate potential human health and environmental effects associated with releases and threatened releases of hazardous substances from the site. The criteria considered are outlined in Section 300.68(e) of the NCP and include such factors as actual or potential direct contact with hazardous material, degree of contamination of drinking water, and extent of isolation and/or migration of the contaminants.

The next step was to develop a range of potential available remedial technologies that could be used to remediate the site. Remedial technologies where treatment permanently and significantly reduces the toxicity, mobility or volume of the hazardous substances, were preferred over remedial technologies not involving such treatment. These technologies were initially pre-screened on a technical basis. Based on the screening, a list of individual remedial technologies appropriate to site conditions and consistent with the remedial action objectives was developed.

The site-appropriate remedial technologies were then combined into a number of preliminary remedial alternatives. The bases for the various combinations were: the technical and logical interrelationship between separate technologies, Section 300.63(f) of the NCP requirements regarding the general categories of alternatives which must be considered and CERCLA Section 121 provisions regarding the preference for remedial actions that utilize permanent solutions and alternative treatment or resource recovery technologies. The summary below reflects guidance set forth in a memorandum issued by EPA on December 24, 1986, entitled, "Interim Guidance on Superfund Selection of Remedy", intended to aid agencies in the selection of remedial actions pending EPA's upcoming revisions of the NCP. EPA's interim guidance requires analysis of alternatives involving: 1) treatment options; 2) containment of waste options with little or no treatment, but providing protection of human health and the environment primarily by preventing exposure or reducing the mobility of the waste; and 3) the no-action alternative. These three categories of alternatives were considered through the detailed evaluation process of the Old Bethpage Feasibility Study.

The fourth step in the process was to develop an analysis of these alternatives as delineated in Section 300.68(g) of the NCP. The three broad criteria utilized in the screening were: the relative effectiveness in minimizing threats; the engineering feasibility of the alternatives; and the cost of implementing the remedial action.

Treatment options and the no-action alternative were carried through this step. This general analysis was intended to reduce the number of remedial alternatives to those appropriate for detailed evaluation.

The final step as outlined in Section 300.68(h) of the NCP was integrated with step four above to provide a detailed analysis of all the site-appropriate alternatives. Treatment, containment, and no-action alternatives were included in this analysis. For each alternative, the following factors, were considered as appropriate:

- An evaluation in terms of engineering implementation, reliability, and constructability;
- An assessment of the extent to which the alternative was expected to effectively prevent, mitigate, or minimize threats to, and provide adequate protection of human health and the environment. This included an evaluation of the extent to which the alternative attained or exceeded ARARs for the site.
- An analysis of whether recycle/reuse, waste minimization, waste biodegradation, destruction, or other advanced, innovative, or alternative technologies were appropriate to reliably minimize present or future threats to human health and the environment (performed in initial screening stage);
- An analysis of any adverse environmental impacts, methods for mitigating these impacts, and costs of mitigation;
- An analysis of institutional problems and considerations such as the difficulty in obtaining permits, easements etc., or the contravention or

conflict of other State or Local laws or policies;

- A detailed cost estimate, including operation and maintenance costs, and distribution of costs over time. This included a cost comparison of alternatives within each category.

B. Development of Old Bethpage Landfill Alternatives and and Initial Screening

Remedial responses for the Old Bethpage Landfill addressed the control and cleanup of contaminated groundwater with the purpose of preventing such contamination from reaching the Farmingdale public drinking water supply wells hydraulically downgradient of the plume of groundwater contamination. Actions to control the source of such contamination (the Landfill), and those to enhance and expedite the cleanup of the groundwater were also evaluated. The existing remedial source control measures at the site were evaluated for their effectiveness in achieving the same purposes.

The objectives of the remedial actions evaluated were: 1) to prevent, to the extent feasible, future contaminant migration from the Landfill; 2) to control the source of the contamination, i.e., the Landfill; 3) to prevent further expansion of the offsite groundwater plume of contamination; and 4) to remediate the plume to ARARs, New York State Groundwater Standards and Drinking Water Guidelines. These objectives are based on a review of the requirements for protection of the public health and the environment and on a review of the ARAR's and EPA Draft Guidelines for Remedial

Action for Contaminated Groundwater at Superfund Sites (EPA October 1986)

For the Old Bethpage Landfill, remedial technologies were pre-screened for technical suitability. The pre-screening criteria included the following:

1. Applicability - physical and chemical suitability for site conditions;
2. Feasibility - the ability of the remediation to achieve the desired objectives;
3. Implementability - ability of the remediation to be employed at the site given the facts of the site and its environs;
4. Safety - the identification of any alternatives which were precluded for health and safety considerations.

The evaluations and conclusions for each alternative in the initial screening process are set forth in Table 2.

Some remedial measures identified in the initial screening were already in place pursuant to the Landfill's Part 360 permit requirements as more fully described supra in Section I.B.4. The RAP provides for the continuation and expansion, if necessary, of these measures and monitoring to confirm their continued effectiveness in meeting the requirements of the RAP.

Based on Table 2, two categories of response actions were identified for further consideration. These were: 1) containment and removal of the contaminated groundwater

TABLE 2

Description of Remedial Actions

INITIAL SCREENING OF ALTERNATIVES

esponse Action	Description	Applicability, Feasibility, Implementability &Safety
o Action	No installation of remedial technology, although some form of monitoring may be required.	Not applicable, as remedial technologies have already been put in place.
ontainment	Containment of contaminants by physical means such as capping and subsurface barrier walls.	Capping is considered to be feasible and is currently underway at the landfill as described in Section 1.1 and as per specifications required in 6 NYCRR Part 360 closure permit. The great depth (1000 ft±) to a continuous confining layer precludes the installation of barrior walls using current technology.
umping	Removal of contaminated ground water, liquids by pumping or removing sediments by dredging.	Pumping of contaminated ground water is under consideration.
ollection	Collection of leachate, gases, and water-borne sediments.	Systems to collect leachate and gases are already in place. The final capping program is intended to prevent transport of contaminated sediments.
iversion	Re-directing surface water flow away from the site.	Not applicable as there is no flowing surface water body within proximity of the site. Contaminated sediment transport by runoff is prevented by the capping program.
omplete Removal	Removal of all wastes and contaminated soils and sediments from the site and restoration.	This action has never been undertaken for a site as large as the Old Bethpage Landfill, and would have serious inherent environmental hazards such as uncontrollable emissions. Since an action of this magnitude has not been proven effective or possible, it is not being considered. Additionally, any off-site contamination would remain after partial or complete removal of the waste.
artial Removal	Removal of some wastes and/or contaminated soil and sediments from the site.	No benefit is discernible from partial removal as wastes at the site are relatively uniform, thus this action is not being considered.

Response Action	Description	Applicability, Feasibility, Implementability, & Safety
On-site Treatment	Treatment or solidification of wastes on-site to render them harmless by physical, chemical or biological treatment.	Waste Treatment requires removal of wastes from their present place, and for reasons given under "Complete Removal", treatment of wastes is not being considered. Solidification for the amount of wastes present at the landfill has never been proven effective or possible and thus is not being considered. Ground-Water On-site treatment of contaminated ground water is being considered.
Off-site Treatment	Treatment of wastes off-site to render them harmless by physical, chemical or biological treatment.	Waste Treatment requires removal of wastes from their present place, and for the reasons given under "Complete Removal", off-site treatment is not being considered. Ground-Water Off-site treatment of contaminated ground water at a Public-Owned Treatment Works (POTW) is being considered.
In-Situ Treatment	Treatment of wastes in place by physical, chemical or biological treatment.	In-Situ treatment of an amount of waste such as exists at the landfill has never been accomplished nor been proven possible, thus this action is not being considered. Hydrogeologic conditions in the offsite plume also make in-situ treatment of this contamination infeasible. The vertical thickness of the plume makes in-situ treatment infeasible. In-situ methods are suitable for treatment of shallow groundwater plumes. Conditions in shallow groundwater are more amenable to supporting the bacterial populations which degrade wastes.
torage	Temporary or permanent storage of waste.	The site is currently a landfill, so this action is not applicable by definition.
n-site Disposal	Disposal of wastes on-site in a landfill or other waste management unit.	This site is currently a landfill, and this act[illegible] [illegible]ould presumably require excavation and redepos[illegible]on; for reasons given under "Complete Removal", this action is not being considered

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Response Action	Description	Applicability, Feasibility, Implementability & Safety
Off-site Disposal	Disposal of wastes off-site in a landfill or other waste management unit.	This action would require removal of wastes, and is not being considered for the reasons given under "Complete Removal".
Alternate Water Supply	Provision of clean drinking water in the event of contamination; this would include treatment of the existing supply or providing another supply.	Contamination has not been detected in the nearest downgradient supply wells, however, monitoring of these supply wells and intermediate wells is on-going and long-term monitoring is being considered.
Relocation	Temporary or permanent relocation of area residents.	At this time, no hazard which would warrant relocation has been identified at this site, therefore, this option will not be considered.

through pumping and subsequent treatment and 2) the continued monitoring of the plume with the provision of an alternative water supply, if necessary. These two categories of response actions were further developed into the following two conceptual designs:

1. Development of a long-term groundwater monitoring program to provide detection of potential contaminant movement toward the Farmingdale public water supply wells. Such detection would provide timely well replacement or treatment system installation, if contamination imminently threatened these public wells.
2. Pumping of the contaminated groundwater through a system of recovery wells, establishment of a water treatment system on or near the Landfill, and subsurface or surface disposal of the treated water.

C. Testing and Analysis of Conceptual Design No. 2

Flow and solute transport models, described in detail in Appendix II, were executed to evaluate the feasibility of actively remediating all or part of the Landfill leachate plume through pumping. The results of the flow modeling indicated that approximately 5 million gallons per day ("MGD") of groundwater would need to be pumped to hydraulically contain the entire area affected by Landfill leachate. The extraction of that amount of water was concluded to be infeasible because:

1. The DEC's water conservation policies for this area of Long Island restrict the extraction of such a large amount of water from the aquifer without replacing it in the vicinity of the extraction (see Environmental Conservation Law Article 15, specifically Section 1527 and regulations promulgated thereunder at 6 NYCRR 602). The discharge of this amount of water outside a 1-mile area would contravene that policy. DEC stated it would prohibit a consumptive withdrawal of that magnitude, outside the 1-mile radius. (See Spitz letter dated July 20, 1986 contained in the administrative record.)
2. The only sizable area within a 1-mile radius of the Landfill available for the recharge of such a large volume of water would be in the Bethpage State Park. Recharge in the Park would interfere with the hydraulic control of the recovey wells thereby defeating a major purpose of the remedial effort. Such enormous recharge would also potentially affect the Farmingdale public drinking wells downgradient of this recharge area. The protection of these wells is also one of the major purposes of the remediation.

The extraction of 5 MGD was also considered inappropriate for the following reasons:

1. Volatile organic compounds were found within an

area substantially smaller than the leachate indicator plume.

2. Concentrations of leachate indicator parameters outside the organic plume but within the Landfill leachate plume, although elevated over background, did not violate drinking water standards.

In consideration of these limitations, subsequent modeling efforts were directed at containing total volatile organic compounds (TVOC) at the defined edge of the organic plume. Flow modeling indicated this portion could be contained with a pumpage of approximately 1.5 MGD. This amount of water pumpage appears feasible since it would effectively contain the edge of the TVOC plume as defined and would not withdraw substantial amounts of potable water from the aquifer.

Solute transport simulations were executed for both abated and unabated scenarios, using various values for natural retardation and decay (removal) processes. Subsequent pump testing verified important input parameters to the model. See "OBSWDC Aquifer Test for Evaluating Hydraulic Control of Leachate Impacted Groundwater", G&M, September 1987. Based on these analyses, it has been concluded that the TVOC plume can be contained within the boundaries of Bethpage State Park, with an appropriate recovery well system operating at a rate sufficient to maintain hydraulic control.

A comparison of the possible variations of this conceptual remedial design is discussed in the next section.

D. Comparison and Detailed Evaluation of Appropriate Alternatives for the Old Bethpage Landfill

This section identifies and describes the remedial actions that were considered appropriate for the Landfill plume and presents the detailed analyses of those alternatives. *(See page 30a). Seven groundwater remedial alternatives were identified which represent the two appropriate general remedial responses set forth in Section II.B above. The first remedial response, termed "Alternative Water Supply" (Alternative No. 1), consisted of monitoring the plume using the existing monitoring well system and the timely replacement or treatment of downgradient water supply systems should they become threatened. The second category of response action was to hydraulically control, by capture and extraction, the TVOC plume through the installation and operation of barrier pumping wells located at the leading edge of that TVOC plume. Alternatives Nos. 2 to 7 represented the possible variations of this response action, setting forth a variety of treatment and disposal methods. These alternatives are listed below together with Alternative No. 1, and are described in subsequent subsections.

Alternative No. 1 - Continued Monitoring and Alternative Water Supply. Figure 7.

*All of these alternatives included the basic remedial components for closure of the landfill. These components are landfill capping, leachate control and methane gas collection. These programs are ongoing and were evaluated as previously described.

Since these remediation elements were already in place or in the construction process at the site, their existence and approximate cost were considered constants in the comparison and detailed evaluation of the groundwater remedial alternatives evaluated. The Town estimated the approximate past and future costs, including estimated operation and maintenance expenses, of these source remediations to be 16 million dollars (capping - $10 million; leachate control $2 million; methane gas - $4 million), of which almost 50 percent has already been expended. This amount does not include the additional costs of each groundwater remedial alternative, which are set forth for each alternative in the following analyses below.

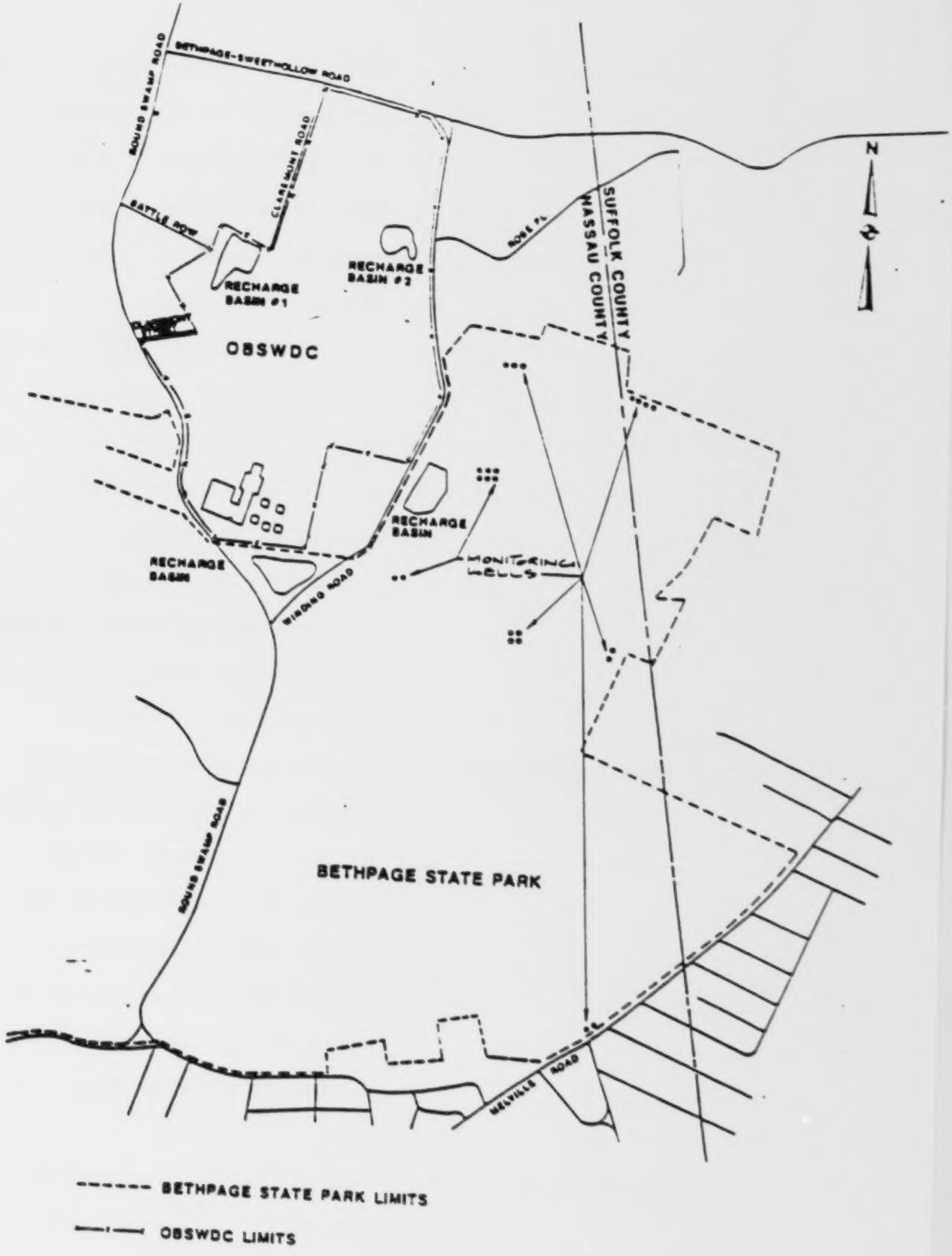

BETHPAGE-SWEETHOLLOW ROAD
ROUND SWAMP ROAD
CLAREMONT ROAD
BATTLE ROW
RECHARGE BASIN #1
RECHARGE BASIN #2
ROSE PL.
SUFFOLK COUNTY
NASSAU COUNTY
N
OBSWDC
RECHARGE BASIN
RECHARGE BASIN
MONITORING WELLS
WINDING ROAD
ROUND SWAMP ROAD
BETHPAGE STATE PARK
MELVILLE ROAD
BETHPAGE STATE PARK LIMITS
OBSWDC LIMITS

FIGURE 7

Alternative No. 2 - Removal of groundwater by pumping and piping to the Landfill property for use in the operation of the proposed Resource Recovery Facility (RRF) and discharge of waste water from the the RRF into the sanitary sewer on Winding Road. Figure 8.

Alternative No. 3 - Removal of groundwater by pumping and piping to the Landfill property for treatment to remove TVOC's and discharge of the treated waste waters to the sanitary sewer system on Winding Road. Figure 9.

Alternative No. 4 - Removal of the groundwater by pumping and piping it to the Landfill property for partial use in the proposed RRF to remove TVOC's and for treatment and discharge of the remaining water to the sanitary sewer system on Winding Road. Figure 10.

Alternative No. 5 - Removal of groundwater by pumping and piping it to a treatment facility to remove TVOC's, and

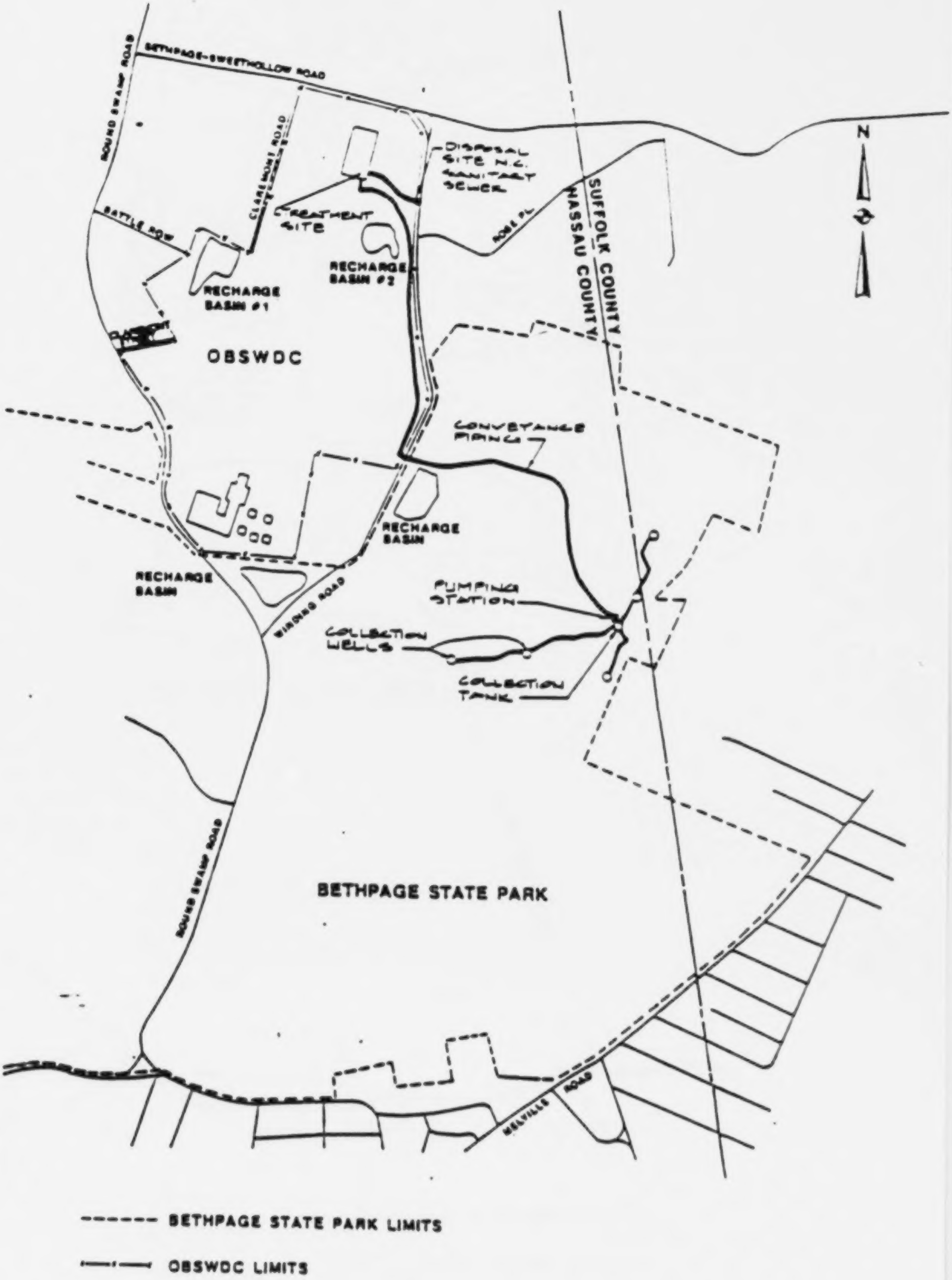
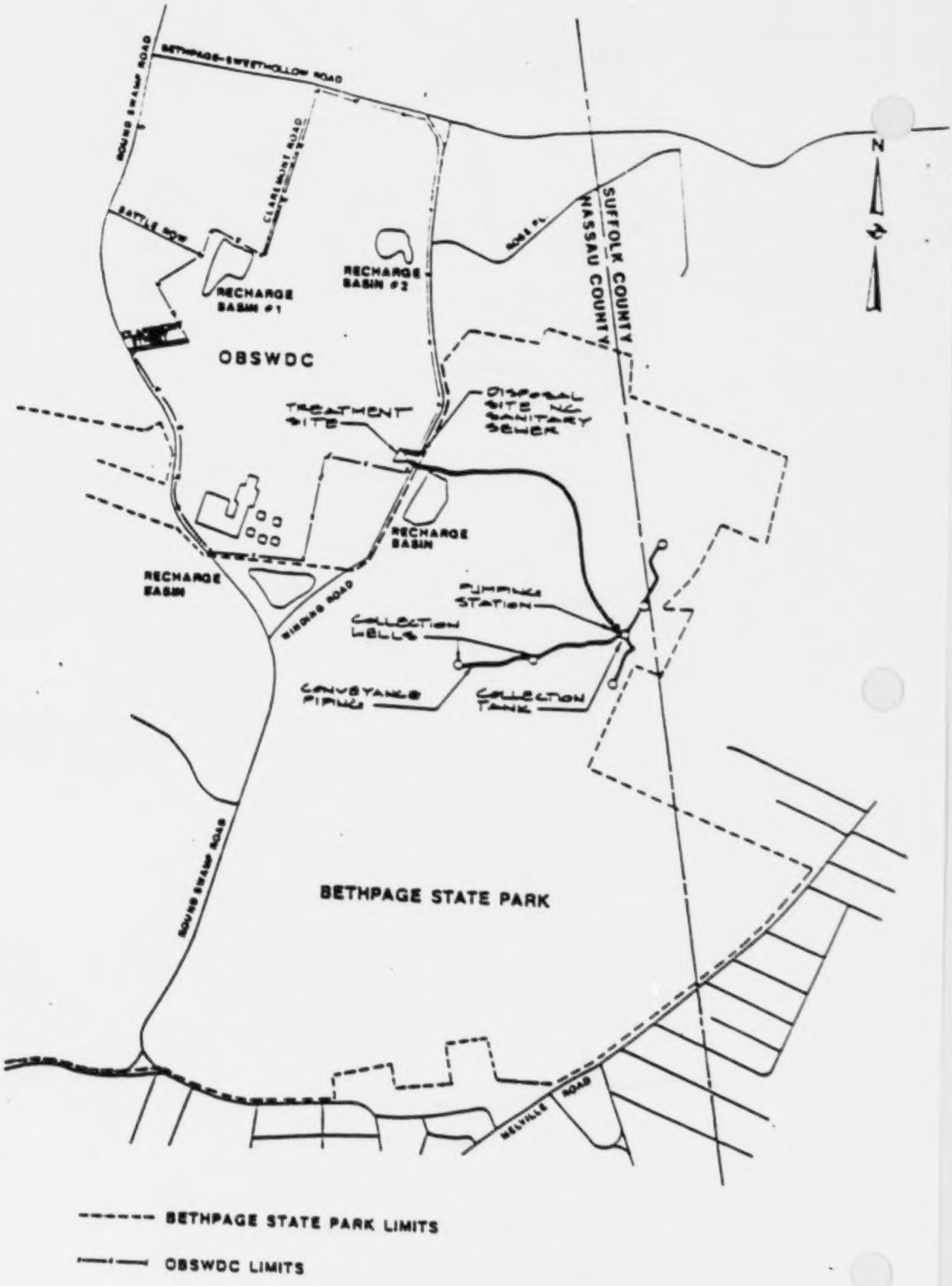

BETHPAGE-SWEETHOLLOW ROAD
ROUND SWAMP ROAD
CLAREMONT ROAD
BATTLE ROW
DISPOSAL SITE N.C. SANITARY SEWER
TREATMENT SITE
RECHARGE BASIN #2
RECHARGE BASIN #1
ROSE PL
SUFFOLK COUNTY
NASSAU COUNTY
N
OBSWDC
CONVEYANCE PIPING
RECHARGE BASIN
RECHARGE BASIN
WINDING ROAD
PUMPING STATION
COLLECTION WELLS
COLLECTION TANK
ROUND SWAMP ROAD
BETHPAGE STATE PARK
MELVILLE ROAD
BETHPAGE STATE PARK LIMITS
OBSWDC LIMITS

FIGURE 6

ALTERNATIVE NO. 2


BETHPAGE-SWEETHOLLOW ROAD
ROUND SWAMP ROAD
CLAREMONT ROAD
BATTLE ROW
RECHARGE BASIN #1
RECHARGE BASIN #2
ROSE PL
SUFFOLK COUNTY
NASSAU COUNTY
N
OBSWDC
TREATMENT SITE
DISPOSAL SITE NO. SANITARY SEWER
RECHARGE BASIN
RECHARGE BASIN
WINDING ROAD
PUMPING STATION
COLLECTION WELLS
CONVEYANCE PIPING
COLLECTION TANK
ROUND SWAMP ROAD
BETHPAGE STATE PARK
MELVILLE ROAD
BETHPAGE STATE PARK LIMITS
OBSWDC LIMITS

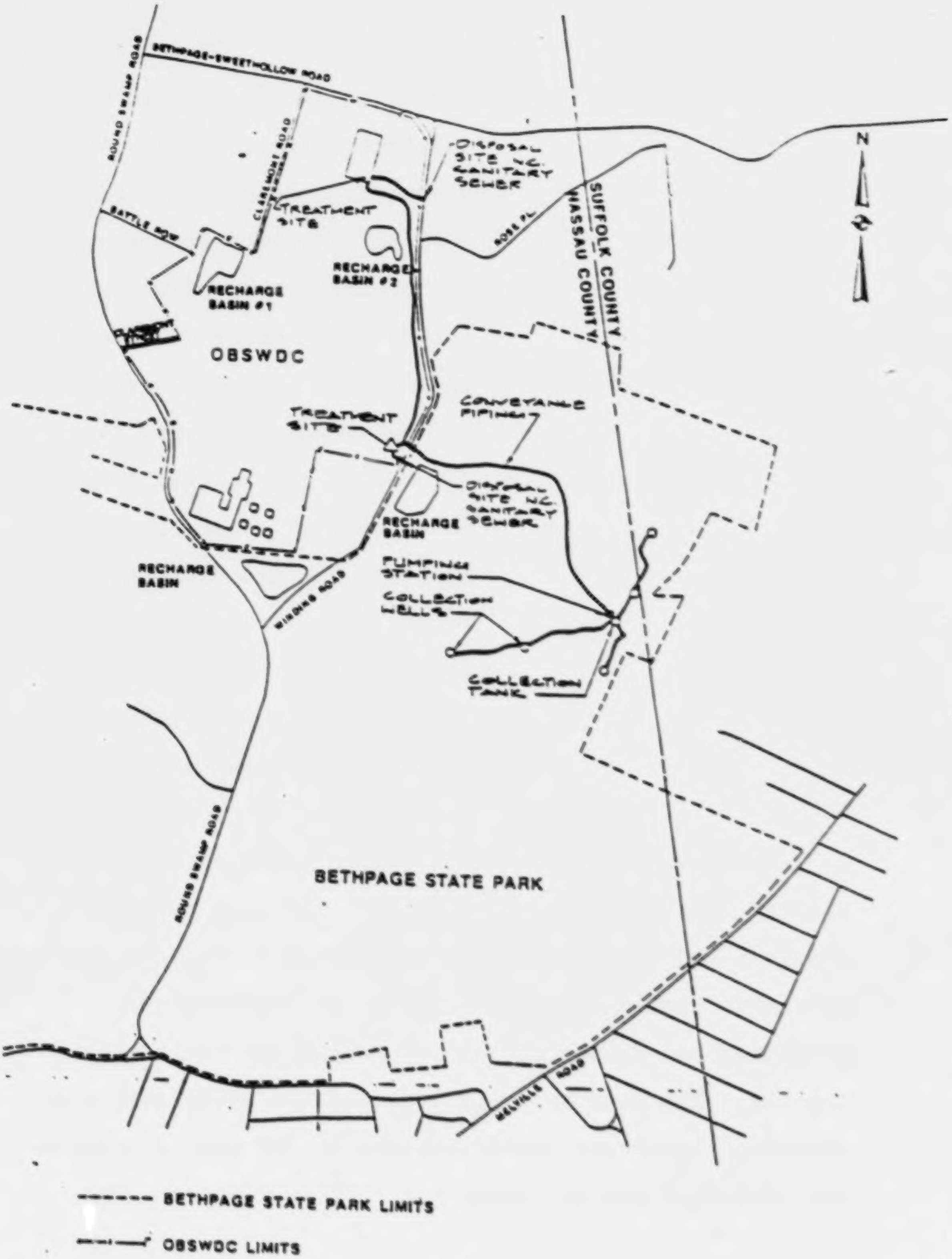

BETHPAGE-SWEETHOLLOW ROAD
ROUND SWAMP ROAD
CLAREMONT ROAD
BATTLE ROW
ROSE PL
DISPOSAL SITE N.C. SANITARY SEWER
TREATMENT SITE
RECHARGE BASIN #1
RECHARGE BASIN #2
SUFFOLK COUNTY
NASSAU COUNTY
N
OBSWDC
CONVEYANCE PIPING
TREATMENT SITE
DISPOSAL SITE N.C. SANITARY SEWER
RECHARGE BASIN
RECHARGE BASIN
WINDING ROAD
PUMPING STATION
COLLECTION WELLS
COLLECTION TANK
ROUND SWAMP ROAD
BETHPAGE STATE PARK
MELVILLE ROAD
BETHPAGE STATE PARK LIMITS
OBSWDC LIMITS

FIGURE 10

ALTERNATIVE NO. 4

discharge of the treated water to a leaching field within Bethpage State Park boundaries. Figure 11.

Alternative No. 6 - Removal of groundwater by pumping and piping it to a treatment facility to remove TVOC's and disposal in a storm sewer on Plainview Road. Figure 12.

Alternative No. 7 - Removal of groundwater by pumping and piping it to the Landfill property for treatment to remove TVOC's and discharge of the treated water to a recharge basin/leaching well system upgradient of the Landfill. Figure 13.

Analyses of the remedial action alternatives was divided into two major categories: non-cost criteria analysis and cost analysis. The non-cost criteria analysis addressed considerations of technical feasibility, institutional issues and environmental and public health impacts. The cost analysis reviewed the major cost items, discussed important considerations in the cost estimation and presented the estimated costs of each alternative.

1. Alternative No. 1

(a) Description

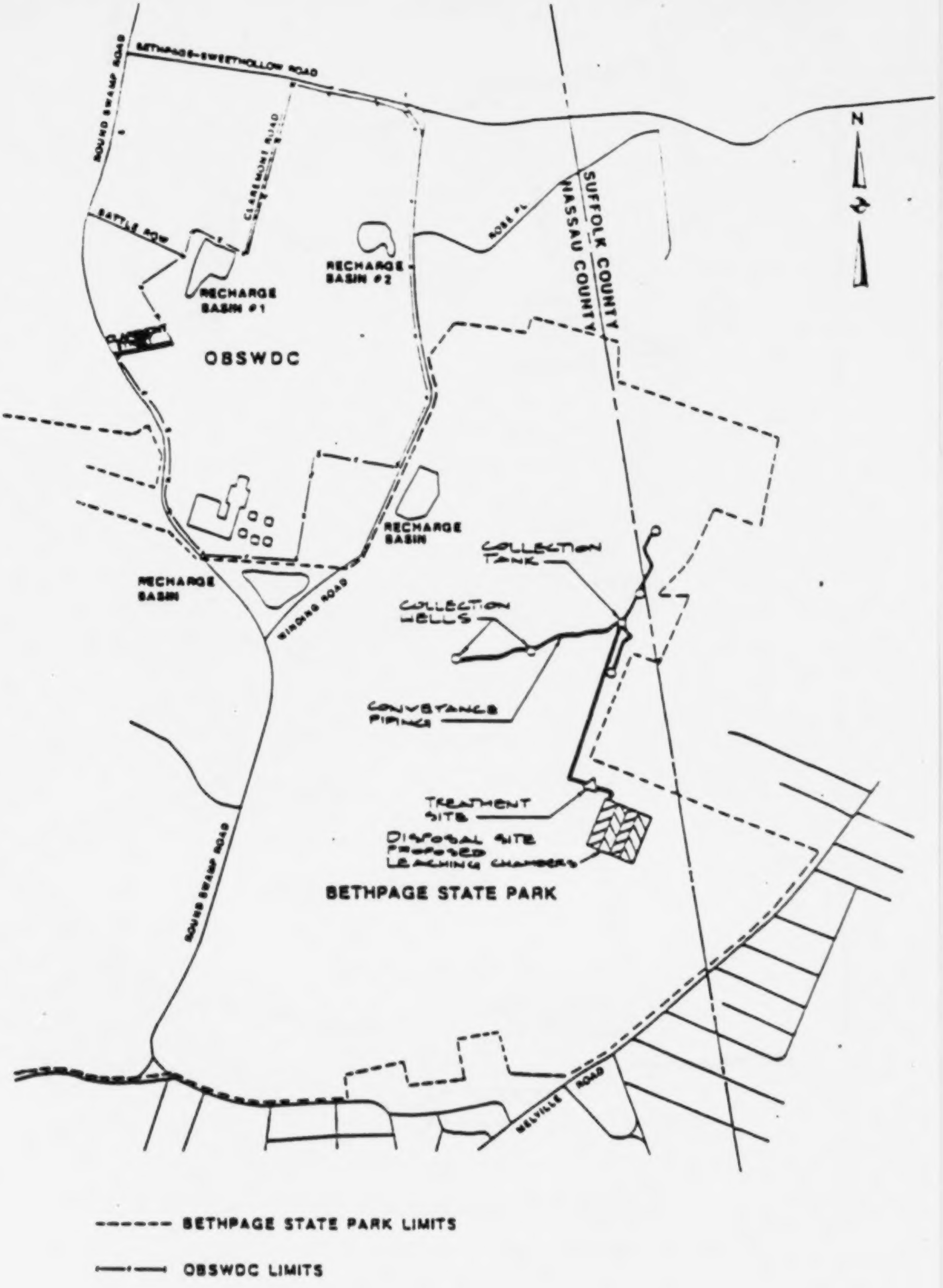
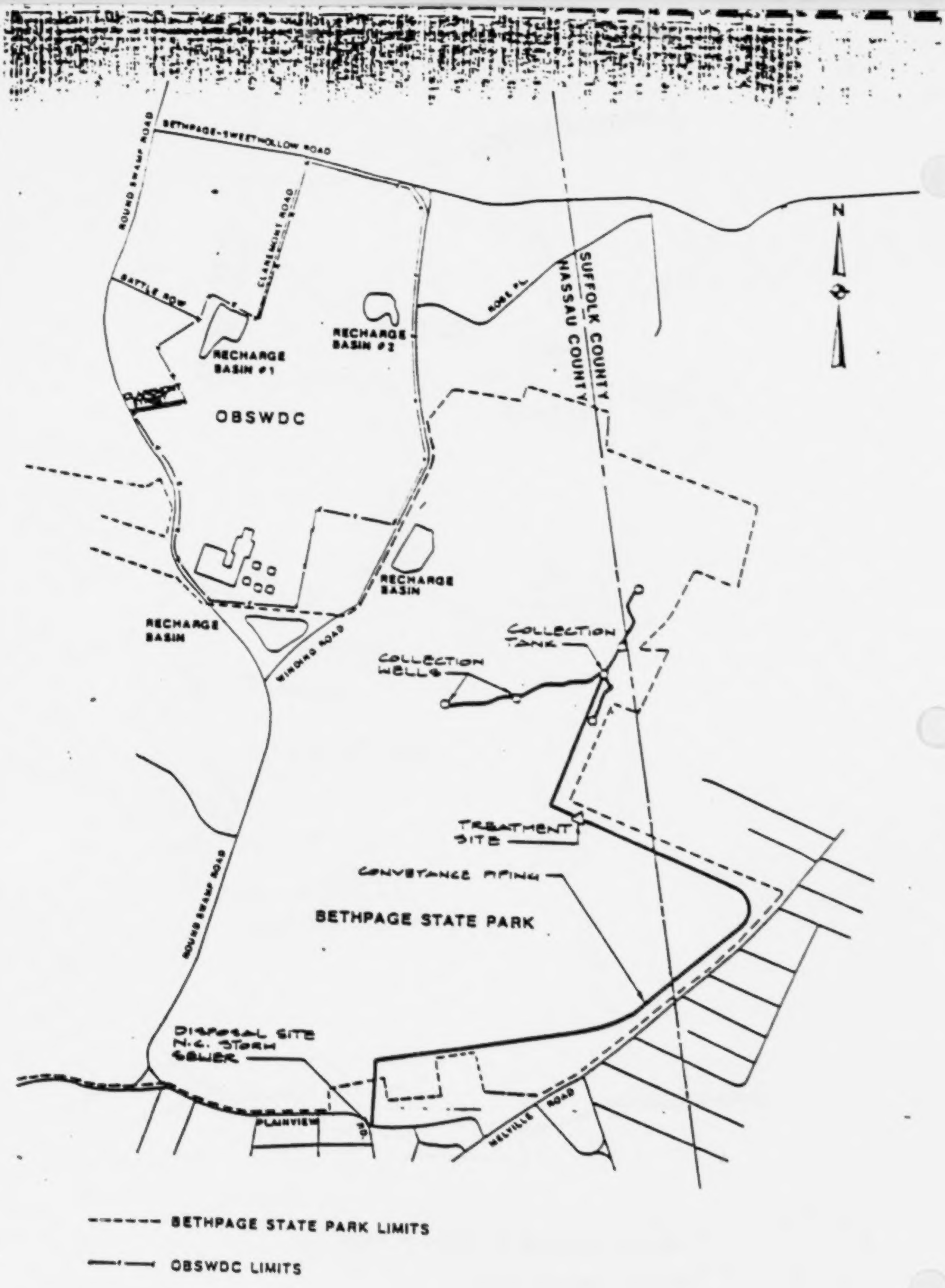

BETHPAGE-SWEETHOLLOW ROAD
ROUND SWAMP ROAD
CLAREMONT ROAD
BATTLE ROW
RECHARGE BASIN #1
RECHARGE BASIN #2
OBSWDC
ROSS PL
SUFFOLK COUNTY
NASSAU COUNTY
N
RECHARGE BASIN
RECHARGE BASIN
WINDING ROAD
COLLECTION TANK
COLLECTION WELLS
CONVEYANCE PIPING
TREATMENT SITE
DISPOSAL SITE PROPOSED LEACHING CHAMBERS
BETHPAGE STATE PARK
ROUND SWAMP ROAD
MELVILLE ROAD
BETHPAGE STATE PARK LIMITS
OBSWDC LIMITS

FIGURE 1.

LKB

ALTERNATIVE NO.


BETHPAGE-SWEETHOLLOW ROAD
ROUND SWAMP ROAD
CLAREMONT ROAD
BATTLE ROW
RECHARGE BASIN #1
RECHARGE BASIN #2
OBSWDC
ROSE PL.
SUFFOLK COUNTY
NASSAU COUNTY
N
RECHARGE BASIN
RECHARGE BASIN
WINDING ROAD
COLLECTION TANK
COLLECTION WELLS
TREATMENT SITE
CONVEYANCE PIPING
BETHPAGE STATE PARK
ROUND SWAMP ROAD
DISPOSAL SITE N.C. STORM SEWER
PLAINVIEW RD.
MELVILLE ROAD
BETHPAGE STATE PARK LIMITS
OBSWDC LIMITS

LKB

FIGURE 12

ALTERNATIVE NO. 6

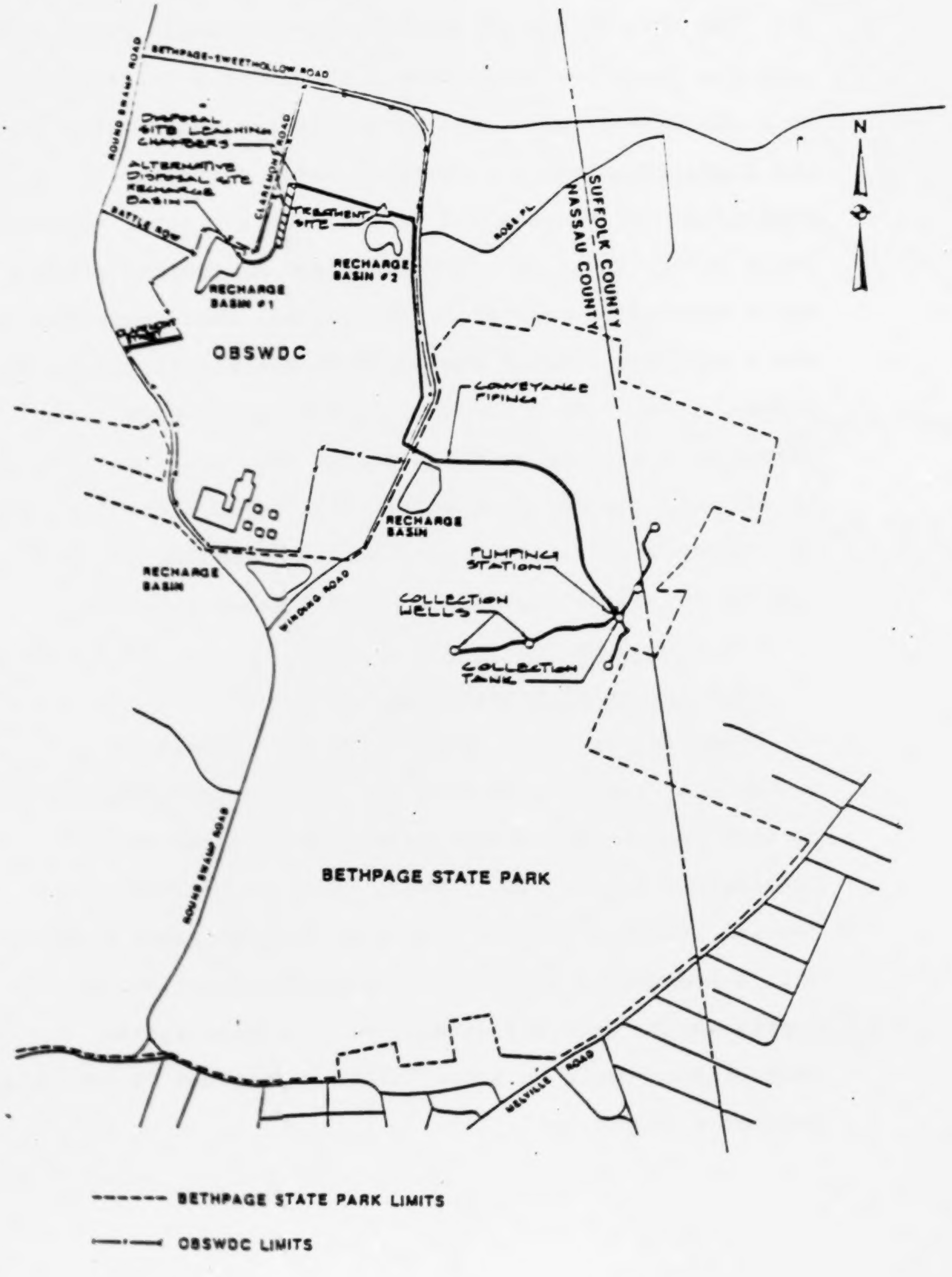

BETHPAGE-SWEETHOLLOW ROAD
ROUND SWAMP ROAD
DISPOSAL SITE LEACHING CHAMBERS
CLAREMONT ROAD
ALTERNATIVE DISPOSAL SITE RECHARGE BASIN
BATTLE ROW
TREATMENT SITE
RECHARGE BASIN #2
RECHARGE BASIN #1
OBSWDC
ROSE PL.
SUFFOLK COUNTY
NASSAU COUNTY
N
CONVEYANCE PIPING
RECHARGE BASIN
RECHARGE BASIN
WINDING ROAD
PUMPING STATION
COLLECTION WELLS
COLLECTION TANK
ROUND SWAMP ROAD
BETHPAGE STATE PARK
MELVILLE ROAD
BETHPAGE STATE PARK LIMITS
OBSWDC LIMITS

FIGURE 13

LKB

ALTERNATIVE NO. 7

The sole intent of this alternative would be to insure that the local residents have a supply of potable water. This could be accomplished by monitoring groundwater quality and plume dynamics on a periodic basis using the 23 monitoring wells installed in the Park and other selected wells in the vicinity. A recommended monitoring program would consist of quarterly sampling and subsequent analyses for a selected list of contaminants characteristic of the plume. Under such a program, contaminants which could potentially migrate toward a supply well would be detected before they reached that well. This would allow for timely well replacement in a non-contaminated portion of the aquifer or installation of a water treatment system.

(b) Non-Cost Criteria

(i) Technical Feasibility

Implementation of Alternative No. 1 would be technically feasible because the network of monitoring wells located between the Landfill and the downgradient Farmingdale public supply wells could be monitored on a regular basis to provide continual data on plume dynamics. Should monitoring indicate contaminant migration toward supply wells, well replacement or treatment system installation could be accomplished before the contamination reached a supply well.

(ii) Environmental Impacts

Alternative No. 1 would have the least beneficial effect on the environment since it provides no improvement to the groundwater resource. Therefore, it would not satisfy the reduction of toxicity, mobility or volume criteria and would not meet the ARAR's criteria for the site. Compared with the other alternatives, there were some positive aspects of Alternative No. 1, such as no loss of potable groundwater from pumping, no increase in air-borne contaminants from water treatment processes and no decrease in Bethpage State Park aesthetics from visible remedial structures.

(iii) Public Health Analysis

Alternative No. 1 would provide long-term public health protection for the public supply wells through timely detection of the migration of contaminants attributable to the Landfill before they reached those supply wells.

(iv) Institutional and Legal Issues

The State found Alternative No. 1 unacceptable as a response action for the Landfill leachate plume because it would not meet the ARAR's identified for this site or the criteria for reduction of toxicity, mobility and volume of contamination.

(c) Cost Analysis

The total estimated cost of Alternative No. 1 was $700,000. This was based on quarterly monitoring of approximately 30 wells (analysis of samples for organic and inorganic parameters), 1987 prices, and the present worth estimated over a period of 10 years with an annual interest rate of 8 percent.

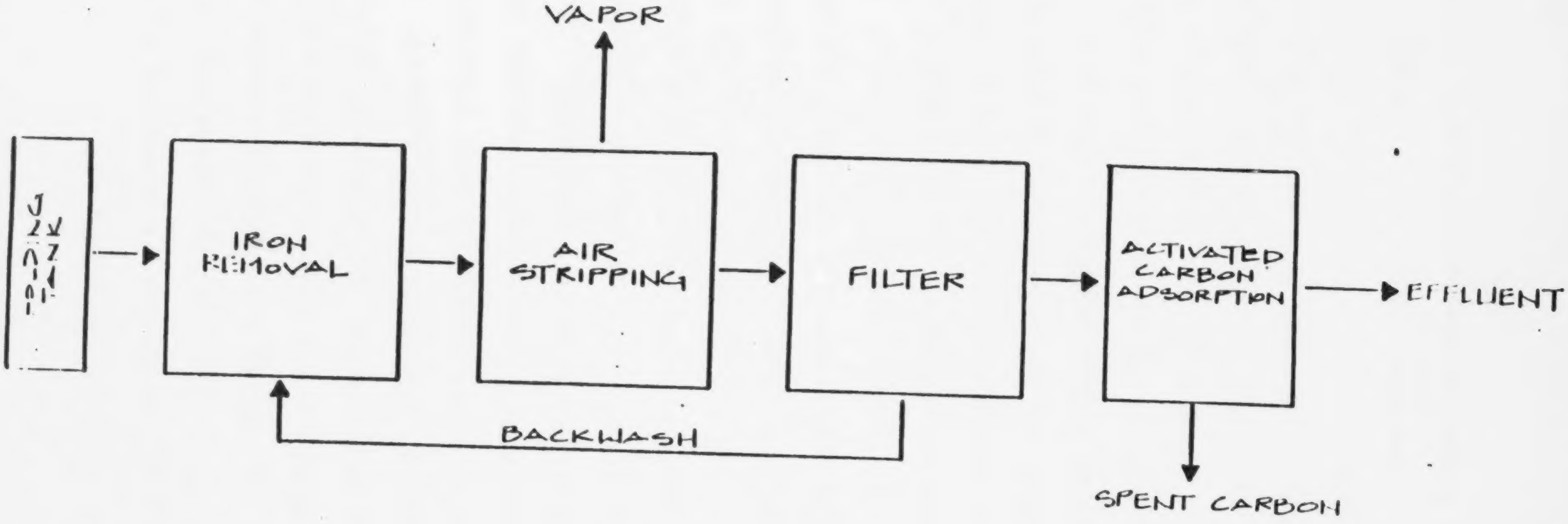
The total cost of this alternative, including the aforementioned source remedial measures, was approximately $16,700.000.

2. Alternatives Nos. 2 to 7

The objective of these alternatives would be to protect downgradient public water supply systems and to clean up the groundwater plume through containment and collection of the TVOC plume. After capture and collection of the plume by the barrier pumping wells, the water would be conveyed through an underground piping system to a location where it would be treated to remove its organic and inorganic contaminants. This would be done through the use of a variety of treatment mechanisms including air stripping towers and, if necessary, carbon adsorption columns and an iron removal system. After treatment, the water would be disposed either through recharge to the ground or discharge to surface waters via sanitary or storm sewers. The general components of these alternatives were the same with respect to the recovery well system and piping transport to treatment systems. They differed only in the discharge locations studied and the treatment systems appropriate to the alternative proposed.

General components of this remedy included: groundwater well pumping, conveyance to a collection tank, transport to a treatment unit (by gravity or pumping, depending upon whether the treatment unit was located upgradient or downgradient of the plume), treatment to attain contaminant concentration levels that meet ARAR's and ultimate conveyance to a disposal point.

As discussed previously, the groundwater well pumping system would have a combined capacity of approximately 1.5 MGD and be located in Bethpage State Park as shown in Figures 8-13. Pumped water would be discharged into a collection tank located within Bethpage State Park. The collection system remained the same for Alternatives Nos. 2 to 7. The treatment system site and the disposal point and method varied for each alternative. The treatment technologies selected for the removal of organic contaminants from the plume were air stripping through a packed tower or a cooling tower, followed by, as needed, activated carbon adsorption. Gross amounts of the lighter, volatile organic compounds, such as chlorinated solvents and light petroleum fractions, could be removed relatively inexpensively and efficiently by air stripping. The remaining trace amounts of light organics and the heavier, less volatile organics might require a more expensive and technically more complex activated carbon process. These process units would be preceded, as necessary, by an iron removal system to remove any excess iron concentration. The technical concepts and design considerations involved in applying these treatment processes are presented in Appendix III and in Section I.E. of the RAP; a schematic of the treatment system is provided in Figure 14.



VAPOR
IRON REMOVAL
AIR STRIPPING
FILTER
ACTIVATED CARBON ADSORPTION
EFFLUENT
BACKWASH
SPENT CARBON

FIGURE 14

CONCEPTUAL TREATMENT SYSTEM–FLOW SCHEMATIC

3. Alternative No. 2

(a) Description

Alternative No. 2 (Figure 8) included the well collection system and a piping system to convey the extracted groundwater from the collection tank to the proposed RRF for utilization as cooling tower "make up" and process water. If the RRF was permitted by DEC, it would be built in the Landfill complex in the vicinity of the present-day incinerators. After being used at the proposed RRF, the waste waters would then be discharged to the Nassau County sanitary sewer system on Winding Road.

(b) Non-Cost Criteria

(i) Technical Feasibility

As discussed previously, flow and transport models as well as pump testing were executed to test the technical feasibility of actively remediating all or part of the Landfill leachate plume by pumping. The results of these efforts indicated that the defined edge of the TVOC plume could be hydraulically controlled by wells operating at an appropriate pumping rate. The Town estimated that the approximate volume to be pumped in maintaining hydraulic control is 1.5 MGD. Based on that pumped volume, the treatment and disposal component of this alternative might not be feasible. Alternative No. 2, which includes the conveyance of plume water to the proposed RRF for use as cooling tower "make up" and process water (which would remove VOC's through air stripping in the cooling towers) could not be implemented if the proposed RRF did not require or have capacity for 1.5 MGD of cooling water. It was anticipated that the proposed RRF would require only 0.5 MGD and this quantity would be variable each day. If that capacity was shown to be the actual capacity of the RRF then Alternative No. 2 would not be feasible and Alternative No. 4, providing for a limited use of the RRF in combination with sewer disposal, would need to be substituted.

(ii) Environmental Impacts

The beneficial effect of Alternative No. 2 on the environment would be its improvement of the quality of the groundwater. There would be some adverse effects, however, which include: a loss of some potable groundwater as a result of pumpage (some quantity of clean groundwater would unavoidably be pumped) and use by the RRF; an increase in airborne emissions from the RRF (although the RRF would be required under its permit to meet all applicable air emissions standards); and a decrease in Bethpage State Park aesthetics due to visible remedial structures and components.

(iii) Public Health Analysis

Alternative No. 2 would provide long-term public health protection through the combined actions of containment of the contaminant plume, removal of contaminants from the groundwater recovery system, and groundwater monitoring to detect any contaminant migration.

(iv) Institutional Issues

Alternative No. 2 included discharge of RRF effluent water to a Nassau County sanitary sewer. Discharge of water into a publicly-owned treatment works (sewer) would require a sewer discharge permit. Preliminary discussions with Nassau County indicated that this discharge into the County's sanitary sewer system from the RRF would be allowed. However, New York State informed the Town that it was not willing to accept this remedial alternative because implementation would be contingent upon future permit approval of the RRF.

(c) Cost Analysis

The total estimated cost for the groundwater portion of Alternative No. 2 was \$2,275,000. The capital and annual operating costs were estimated based on the Town's estimated flow of 1.5 MGD. All estimates were based on 1987 prices and the present worth of the operating cost was estimated over a period of 10 years with an annual interest rate of 8 percent. The above cost did not include land purchasing, building construction, or personnel expenditures required for operating and maintaining the facilities.

The total cost of this alternative, including source remedial measures, was \$18,275,000.

4. Alternative No. 3

(a) Description

Alternative No. 3 (Figure 9) consisted of the recovery well system and a conveyance system from the collection tank to the treatment site and then to the disposal site. The proposed point of disposal was the Nassau County sanitary sewer on Winding Road. The proposed treatment facility would be built at the southeast corner of the Landfill property and would consist of the treatment systems described in Section II.D.2 above.

(b) Non-Cost Criteria

(i) Technical Feasibility

Flow and transport models and pump tests were executed to test the technical feasibility of actively remediating all or part of the Landfill leachate plume by pumping. The results of these efforts indicated that the defined edge of the TVOC plume could be hydraulically controlled by wells operating at an appropriate pumping rate. The Town estimated that the approximate volume to be pumped to maintain hydraulic control of this plume would be 1.5 MGD. Based on that pumped volume, Alternative No. 3 was technically feasible with respect to plume collection. However, a factor which potentially limited the appropriateness of this alternative was the actual capacity of the sanitary sewer lines. A preliminary study was performed by the Town on the sewer line along Winding Road which showed that the line's excess capacity might be 1.5 MGD. Additional investigations would have been needed to confirm this estimate.

(ii) Environmental Impacts

Alternative No. 3 would have a beneficial effect on the environment through containment of the contaminated plume and improvement of the quality of the groundwater resource. There would be some adverse effects, however, which included: a loss of some potable groundwater as a result of pumpage, an increase in airborne emissions from the treatment facility (although any treatment facility would be required to meet all applicable air emissions standards), and a decrease in Bethpage State Park aesthetics due to visible remedial structures and components.

(iii) Public Health Analysis

Alternative No. 3 would provide long-term public health protection through the combined actions of containment and removal of contaminants from the groundwater recovery system and groundwater monitoring to detect potential contaminant migration towards the downgradient public supply wells.

(iv) Institutional Issues

Alternative No. 3 included discharge of treated plume water to a Nassau County sanitary sewer. Discharge of water into a publicly owned treatment works (sewer) would require a sewer discharge permit. Preliminary discussions with Nassau County indicated that even though the Town would treat the plume water to acceptable quality, the County would not permit that water to be discharged into their sanitary sewer system.

More importantly, DEC's water conservation policies would restrict this depletion of the groundwater from a sole source aquifer.

Any treatment facility must also comply with all applicable air emissions standards and permit requirements. It was anticipated that such requirements would be attainable.

(c) Cost Analysis

The total estimated cost of the groundwater portion of Alternative No. 3 was $4,165,000. The capital and annual operating costs were estimated based on the Town's estimated groundwater flow of 1.5 MGD. All estimates were based on 1987 prices and the present worth of the operating cost was estimated over a period of 10 years with an annual interest rate of 8 percent. The above cost did not include land purchasing, building construction, or personnel expenditures required for operating and maintaining the facilities.

The total cost, including source remedial measures, was $20,165,000.

5. Alternative No. 4

(a) Description

Alternative No. 4 (Figure 10) combined the technologies of Alternatives Nos. 2 and 3, and included the conveyance of extracted groundwater from the collection tank to both the RRF and a proposed treatment plant at the southeast corner of the Landfill property. This alternative reduced the quantity of water that would have to be treated at the proposed RRF, since only a portion of water would be conveyed to the proposed RRF for use as "make up" process water. The water from the treatment facility would be disposed of in the Nassau County sanitary sewer line on Winding Road.

(b) Non-Cost Criteria

(i) Technical Feasibility

Flow and transport models and pump tests were executed to test the technical feasibility of actively remediating all or part of the Landfill leachate plume by pumping. The results of these efforts indicated that the defined edge of the TVOC plume could be hydraulically controlled by wells operating at an appropriate pumping rate. The Town estimated that the approximate volume to be pumped in maintaining that hydraulic control was 1.5 MGD. Based on that estimate, Alternative No. 4 was technically feasible with respect to plume collection and control. However the disposal component of this alternative might not have been feasible. Alternative No. 4, similar to Alternative No. 3, required discharge of treated plume water to the Nassau County sanitary sewer system. Preliminary studies indicated that the capacity of the sewer on Winding Road was adequate. However, remaining lines that connect to the municipal water treatment plant would need to have been analyzed to confirm adequate capacity.

(ii) Environmental Impacts

The beneficial environmental effect from Alternative No. 4 would be containment of the contaminated plume and improvement to the quality of the groundwater resource. Adverse effects of this alternative included: a loss of potable groundwater through pumpage, use by the RRF, and disposal into the sewer; an increase in airborne emissions from both the treatment facility and the RRF (although the treatment facility and the RRF would be required to meet all applicable air emissions standards); and a decrease in Bethpage Park aesthetics due to visible remedial structures and components.

(iii) Public Health Analysis

Alternative No. 4 would provide long-term public health protection through the combined actions of containment and removal of contaminants from the groundwater recovery system and groundwater monitoring to detect potential contaminant migration towards a public supply well.

(iv) Institutional Issues

Alternative No. 4 included discharge of treated plume water to a Nassau County sanitary sewer. Discharge of treated water into the sewer would have required a permit. Preliminary discussions with Nassau County indicated that it would not permit discharge of the treated plume water into its sanitary sewer system.

More importantly, DEC's water conservation policies would restrict depletion of this volume of groundwater from a sole source aquifer.

Although discharge of the RRF effluent water into the Nassau County Sanitary Sewer might have been attainable, New York State informed the Town that the State would not accept a remedial alternative that was contingent upon approval of the RRF.

Any treatment facility would need to comply with all applicable air emissions standards and permit requirements. It was anticipated that such requirements would be attainable.

(c) Cost Analysis

The total estimated cost of the groundwater portion of Alternative No. 4 was $4,380,000. The capital and annual operating costs were estimated based on the anticipated flow of 1.5 MGD. All estimates were based on 1987 prices and the present worth of the operating cost was estimated over a period of 10 years with an annual interest rate of 8 percent. The above cost did not include land purchasing, building construction, or personnel expenditures required for operating and maintaining the facilities.

The total cost, including the source remedial measures was $20,380,000.

6. Alternative No. 5

(a) Description

This alternative (Figure 11) involved the conveyance of extracted groundwater by gravity from the collection tank to a treatment facility and a leaching field, both to be constructed in the Park.

(b) Non-Cost Criteria

(i) Technical Feasibility

Flow and transport models were executed and a pump test run to test the technical feasibility of actively remediating all or part of the Landfill leachate plume by pumping. The results of these efforts indicated that the defined edge of the TVOC plume could be hydraulically controlled by wells operating at an appropriate pumping rate. The Town estimated that the approximate volume of groundwater to be pumped in maintaining hydraulic control would be 1.5 MGD. Based on that volume, Alternative No. 5 was technically feasible with respect to plume collection and control. However, Alternative No. 5 was not considered technically or institutionally feasible with respect to its disposal component.

Alternative No. 5, in general terms, searched for a recharge location close to the proposed recovery wells so that the cost of piping the water back to the Landfill could be avoided. Any potential Alternative No. 5 recharge location had to meet two preconditions: 1) the location could not interfere with the efficiency of the recovery wells themselves and 2) the recharge could not be located in an area potentially affected by two other suspected (since confirmed) sources of contamination to the east and west of the Landfill, the Nassau County Fireman's Training Facility and Claremont Polychemical, respectively.

The first criterion eliminated any location within approximately 2500-3000 feet of the pumping wells, the estimated combined affect of the recharge and the cone of influence of the pumping wells. (See G&M letter of October 26, 1987 contained in the administrative record.) Basic elements of the calculations demonstrating the need for approximately 3000 feet of separation were verified in the field pump test. Since it is required that these recovery wells create a hydraulic barrier for the plume of contamination, the addition of a mounding effect to this cone of influence would diminish the effectiveness of the required hydraulic barrier. Due to the proximity to the Landfill plume to the Fireman's Training Center and Claremont sources of contamination, locations east and west of the Landfill plume and downgradient of those sources were similarly rejected.

Therefore, the only area left for potential recharge under Alternative No. 5 was the southernmost portion of the Bethpage State Park, an area currently used as a public golf course. Although it is technically "feasible" to discharge in this area, it has the major institutional and health concern disadvantages described in the following sections.

(ii) Environmental Impacts

The beneficial effects of Alternative No. 5 on the environment are containment of the contaminant plume and improvement of the quality of the groundwater. It also provides water conservation because plume water would be returned to the aquifer via the leaching field. Adverse effects of this alternative include an increase in airborne emissions from the treatment facility (although any treatment facility would be required to meet all applicable air emissions standards) and a decrease in Bethpage State Park aesthetics due to the treatment facility, the recharge basin, and leaching field being located in the Park.

(iii) Public Health Analysis

Alternative No. 5 will provide long-term public health protection through the combined actions of containment and removal of contaminants from the groundwater recovery system and groundwater monitoring to detect potential contaminant migration toward a public supply well. However, since the treatment facility and the groundwater recharge would both be located in or close to the public golf course in Bethpage State Park, this alternative presents a greater potential for public exposure to the discharges from this remedial program than the other proposals.

In addition, the discharge water, even though only slightly contaminated, would be placed at a point only one thousand feet upgradient of the nearest Farmingdale public drinking supply well and outside and downgradient of the containment system. If temporary treatment system malfunctions occur, this alternative has the potential to discharge contamination in excess of allowable standards and guidelines outside the recovery zone and only one thousand feet upgradient of the drinking wells. This presents further potential for future public exposure to contamination.

(iv) Institutional Issues

Alternative No. 5 includes discharge of treated plume water to the groundwater via leaching fields in Bethpage State Park. Discharge of treated water into the groundwater would require a National Pollutant Discharge Elimination System (NPDES) permit. In order to obtain the permit, pollutant concentrations in the discharge would need to meet or exceed the applicable effluent/groundwater quality standards. The extracted groundwater could be treated to attain all clean-up goals and, therefore, the NPDES permit for Alternative No. 5 was anticipated to be obtainable. Any treatment facility would need to comply with all applicable air emissions standards and permit requirements. It was anticipated that such requirements would be attainable.

However, the location of a treatment facility and discharge basin (covering approximately 5 acres) in Bethpage State Park would require that easements and rights of way in the Park be obtained. It would also require major restructuring and redesign of the current golf course facility and re-routing of public access pathways to avoid contact with the treatment and discharge facilities. It was determined that such easments and rights of way would be difficult to obtain and that the major restructuring of the golf course was not possible, as a practical matter.

(c) Cost Analysis

The total estimated cost of the groundwater portion of Alternative No. 5 was $5,935,000. The capital and annual operating costs were estimated based on a flow of 1.5 MGD. All estimates were based on 1987 prices. The present worth of the operating cost was estimated over a period of 10 years with an annual interest rate of 8 percent. The above cost did not include land purchasing, building construction, or personnel expenditures required for operating and maintaining the facilities.

The total cost, including the source remedial measures, was $21,935,000.

7. Alternative No.6

(a) Description

Alternative No. 6 (Figure 12) involved the conveyance of the plume water by gravity to a treatment facility to be located in the Park and thereafter, conveyance of the effluent to a storm sewer on Plainview Road. The storm sewer would ultimately discharge to a municipal recharge basin. The treatment plant effluent would be conveyed to the storm sewer by piping through the Park or around the perimeter of the Park.

(b) Non-Cost Criteria

(i) Technical Feasibility

Flow and transport models were executed and pump tests run to test the technical feasibility of actively remediating all or part of the Landfill leachate plume by pumping. The results of the modeling effort indicated that the defined edge of the TVOC plume could be hydraulically controlled by wells operating at an appropriate pumping rate. The Town estimated that the volume of discharge resulting from the maintenance of that hydraulic barrier would be 1.5 MGD. Based on that discharge volume, Alternative No. 6 was technically feasible with respect to plume collection and control.

The disposal aspect of this alternative might not be feasible if the storm sewer or recharge basin did not have adequate capacity to handle the 1.5 MGD flow. A preliminary cost was estimated over a period of 10 years with an annual site evaluation of these two components by the Town suggested that adequate capacity was available.

(ii) Environmental Impacts

The beneficial effects of Alternative No. 6 on the environment were containment of the contaminated plume; improvement of the quality of the groundwater resource and water conservation (a portion of the treated plume water will be returned to the groundwater via the recharge basin). Adverse effects of this alternative included: a loss of water from the aquifer (a portion of the treated plume water would be discharged to Massapequa Creek which flows into the South Oyster Bay); an increase in airborne emissions (from the proposed treatment facility, although any treatment facility would be required to meet all applicable air emissions standards); and a decrease in Bethpage State Park aesthetics due to treatment plant construction in the Park, as well as other visible remedial structures and components.

(iii) Public Health Analysis

Alternative No. 6 would provide long-term public health protection through the combined actions of containment and removal of contaminants from the groundwater system and groundwater monitoring to detect potential contaminant migration towards the public supply wells. The discharge location, however, would be in an area that is now accessible to the public. Although the anticipated levels of contamination would be well within discharge limits, discharging in this area would increase public exposure to small levels of contamination and also place contamination outside the recovery well containment system. Furthermore, if the treatment system experienced a temporary malfunction, higher levels of contamination would discharge into the creek until the system could be shut down.

(iv) Institutional Issues

Alternative No. 6 would require permits for discharge of the treated plume water to the storm sewer-recharge basin-Massapequa Creek system. It was anticipated that these permits would not be obtainable because Massapequa Creek traverses a populated residential area of Long Island. Although the discharge water would be treated, there would be a potential for direct personal contact with the water, since disposal would be to surface water and access to that water cannot be controlled. In this regard, this option was not as desirable as other alternatives in view of health and institutional considerations. In addition, DEC's water conservation policies restrict depletion of a sole source aquifer.

Any treatment facility would need to comply with all applicable air emissions standards and permit requirements. It was anticipated that such requirements would be attainable.

(c) Cost Analysis

The total estimated cost of the groundwater portion of Alternative No. 6 was $6,135,000. The capital and annual operating costs were estimated based on a flow of 1.5 MGD. All estimates were based on 1987 prices and the present worth of the operating cost was estimated over a period of 10 years with an annual interest rate of 8 percent. The above cost did not include land purchases, building construction, or personnel expenditures required for operating and maintaining the facilities.

The total cost, including the source remedial measures, was $21,935,000.

8. Alternative No. 7

(a) Description

Alternative No. 7 (Figure 13) included the conveyance of the extracted plume water to a treatment facility at the Landfill to remove TVOC's. After treatment, the water would be conveyed and discharged to either an existing recharge basin and/or a leaching field on the Landfill property.

(b) Non-Cost Criteria

(i) Technical Feasibility

Flow and transport models were executed and pump tests run to test the technical feasibility of actively remediating all or part of the Landfill leachate plume by pumping. The results of the modeling effort indicated that the defined edge of the TVOC plume could be hydraulically controlled by wells operating at an appropriate pumping rate. The Town estimated that the maintaining of hydraulic control would result in 1.5 MGD of discharge water. Based on that discharge volume, Alternative No. 7 was technically feasible with respect to plume collection and control. Alternative No. 7 involved conveyance of treated plume water to a proposed leaching field and recharge basin located in the northwestern portion of the Landfill property. The combined leaching field/recharge basin system could be designed to accommodate the 1.5 MGD flow. Thus the disposal component of this alternative was deemed feasible.

(ii) Environmental Impacts

In comparison to Alternatives Nos. 1 through 6, Alternative No. 7 would provide the largest number of beneficial affects on the environment. Implementation of Alternative No. 7 would: contain the plume; improve the groundwater resource (by removing the contaminated water); conserve water (by returning virtually all the extracted water back to the aquifer via the leaching field/recharge basin system); and contain the residual contaminants in the discharge water by disposing them hydraulically upgradient of the extraction wells so that they could be recovered and treated continuously in a closed recovery system.

Adverse effects of Alternative No. 7 included an increase in airborne contaminants from treatment processes, (although any treatment facility would be required to meet all applicable air emissions standards) and a decrease in Bethpage State Park aesthetics due to visible remedial structures and components. The latter adverse effect would be very minimal because the bulk of the remedial components (treatment facility/recharge/leaching fields) would be located on the Landfill property.

(iii) Public Health Analysis

Alternative No. 7 would provide long-term health protection by:

1) the hydraulic control of the plume to protect the downgradient public supply wells;
2) the removal of contaminants from that groundwater system;
3) long-term monitoring to detect any potential contaminant migration towards the public supply wells; and
4) the recharge of the discharge water into the groundwater containment and recovery system thereby eliminating exposure to the recharge water in places of public access.

(iv) Institutional Issues

Alternative No. 7 would require a NPDES permit or its equivalent for discharge to the groundwater via the recharge basin/leaching field system and air permits or their equivalents for treatment of the contaminated groundwater. These would be obtainable since pollutant concentrations in the plume water can be reduced to meet applicable effluent/groundwater and air standards.

(c) Cost Analysis

The total estimated cost of the groundwater portion of Alternative No. 7 was $7,045,000. The capital and annual operating costs were estimated based on a flow of 1.5 MGD. All estimates were based on 1987 prices and the present worth of the operating cost was estimated over a period of 10 years with an annual interest rate of 8 percent. The above cost did not include land purchasing, building construction, or personnel expenditures required for operating and maintaining the facilities.

The total cost, including the source remedial measures, was $23,045,000.

III. ANALYSIS AND SELECTION PROCESS OF RECOMMENDED ALTERNATIVE

A. Description of the Recommended Alternative

According to 40 CFR Section 300.68(i) of the NCP, the appropriate remedy shall be determined by the lead agency's selection of a cost-effective remedial alternative that effectively mitigates and minimizes threats to and provides adequate protection of human health and the environment. In addition, CERCLA, as amended by SARA, requires a costeffective remediation which protects human health and the environment, utilizes permanent solutions and alternative treatment technologies or resource recovery options, and attains federal and state ARARs to the greatest extent practicable.

After review and evaluation of the remedial alternatives presented in the feasibility study, the State presented Alternative No. 7 in combination with the existing remedial activities at the Landfill to the public as the preferred remedy for the Old Bethpage Landfill.

This alternative consists of:

1. hydraulic control of the defined plume;
2. treatment of the recovered water by an air stripper and, if necessary, iron removal and carbon adsorption to meet all applicable federal and state air emissions standards (see Table 1) and all applicable federal, state and local discharge criteria for the discharge of the recovered water;
3. discharge of the recovered water into an injection well system with an auxiliary recharge basin available (capacity 1.5 million gallons of water) at a location on the Landfill upgradient of the recovery wells (see Figure 13);
4. clean-up of the plume to meet N.Y. State groundwater standards and drinking water guidelines (see Table 1) or attainment of zero-slope condition throughout the plume and implementation of any required remedial technology to further reduce contamination (for full explanation of cleanup criteria, see Section III of the RAP attached hereto);
5. implementation of a groundwater monitoring program to measure the effectiveness and performance of the remediation as set forth in Section II of the RAP;
6. completion of the capping of the Landfill (see

Section I.G. of the RAP) to meet required permeability and other ECL (6 NYCRR Part 360) requirements;

7. continuation and expansion or enhancement, if necessary, of the leachate control and gas collection systems at the Landfill per Section I.H. and I.I. of the RAP and continued monitoring of the gas collection system as set forth in Section I.H. of the RAP.

Alternative No. 7 was recommended because it adhered most closely to the criteria set forth in 40 CFR Section 300.68(i) and the applicable provisions of CERCLA/SARA and provided more positive environmental, health, and effectiveness benefits and fewer disadvantages than the other alternatives. A summary of the non-cost analysis of the benefits and disadvantages of each alternative is set forth on Table 3.

B. Reasons for Rejecting Alternatives 1 Through 6

The major reasons for not recommending the other six alternatives are set forth below.

1. Alternative No.1

Alternative No. 1, the no action alternative, was not recommended because it failed to achieve a number of the criteria for selecting a remedy. Since Alternative No. 1 would require only plume monitoring, the present plume migration and contaminate levels would continue unabated. Therefore there would be:

TABLE 3

NON-COST CRITERIA ANALYSIS

Alternative No.	Brief Description	Technical Feasibility	Environmental Impacts Positive	Environmental Impacts Negative	Institutional Issues
1*	"Alternative Water Supply"	The monitoring of the 23 wells installed in the Park and other wells in the vicinity, will be effective in detecting contaminate migration long before they reach any well. This would allow for timely well replacement or treatment system installation.	No loss of groundwater No increase in airborne emissions. No affect on Park aesthetics.	No improvement to groundwater quality; no hydraulic control of plume.	NYSDOL has stated that they will not allow this Alternative SINCE IT DOES NOT RESULT IN COMPLIANCE WITH ARARs.
2**	Removal of groundwater by pumping, pipe to RRF and discharge to N.C. sewer.	Collection and containment of the plume by pumping was shown to be effective through numerical models presented in Section II. A factor that may affect implementability, is the quantity of water usable by the RRF as cooling water. This cannot be ascertained until a RRF vendor is selected.	Improvement in quality of groundwater resource. Water conservation (the use of plume water in RRF as cooling water).	Reduction in groundwater resource. Limited affect on Park aesthetics (wells, storage tank, pump station and pipe will be installed below grade or behind wooded areas).	
3**	Removal of groundwater by pumping pipe to proposed treatment facility in ODSWDC, and discharge to N.C. sewer system.	Collection and containment of the plume by pumping was shown to be effective through numerical modeling (Section II). Feasibility may be hindered if the sewer does not have sufficient capacity available to accept the 1.5 MGD.	Improvement in quality of groundwater resource.	Reduction in groundwater resource. Increase in airborne emissions from treatment facility. Limited affect on Park aesthetics; the major structure, the treatment facility will be installed in ODSWDC.	A permit to discharge into N.C. sanitary sewer will be required, and may not be attainable if the sewer capacity is inadequate.
4**	Removal of groundwater by pumping, conveyance to both the RRF and a treatment facility proposed for ODSWDC; discharge to N.C. sewer.	Collection and containment of the plume by pumping was shown to be effective through the use of numerical models (Section II).	Improvement in quality of groundwater resource. Some water conservation (portion of plume will be used in RRF as cooling water).	Some reduction in groundwater resource. Some increase in airborne emissions from treatment. Limited effect on Park aesthetics (treatment facility will be installed in ODSWDC; other appurtenances below grade or in wooded area).	A permit to discharge into N.C. sanitary sewer will be required and may not attainable if sewer capacity is inadequate to handle flow.

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5**	Removal of groundwater by pumping, conveyance to treatment facility and discharge to leaching field to be constructed on property in Park.	Collection and containment of the plume by pumping was proved effective through the use of numerical models (Section II).	Improvement in quality of groundwater resource. No loss of groundwater (plume water returned to aquifer via leaching field).	Increase in airborne emissions from treatment facility. Effect on Park aesthetics due to treatment facility which will be constructed in the vicinity of the Park.	A NPDES permit (OR ITS EQUIVALENT) will be required and should be attainable.
6**	Removal of groundwater by pumping, treatment in facility to be located in the Park; effluent discharge to storm sewer on Plainview Road.	Collection and containment of the plume by pumping was proved effective through use of numerical models (Section II). Feasibility may be hindered if storm sewer system does not have the required capacity to handle 1.5 MGD.	Improvement in quality of groundwater resource. No loss of groundwater (plume water returned to aquifer via storm sewer/recharge basin system).	Increase in airborne emissions from treatment facility. Effect on Park aesthetics due to treatment facility which will be constructed in the area of the Park.	A NPDES permit (OR ITS EQUIVALENT) will be required and may not be obtainable if the capacity of the storm sewer is not adequate to handle the flow.
7**	Removal of groundwater by pumping to existing CUSWDC recharge basin and proposed leaching field along Claremont Road (treatment facility to be located on CUSWDC.)	Collection and containment of the plume by pumping was proved effective through the use of numerical models (Section II).	Improvement in quality of ground water resource. Water conservation	Increase in airborne emissions from treatment plant. Limited affect on Park aesthetics; treatment facility and piping etc. will be below grade, or in woods or in CUSWDC.	NPDES permits (OR ITS EQUIVALENT) will be required and should be attainable.

* Alternative 1 will provide long-term public health protection through timely detection of the migration of contaminants before they reach supply wells.

** Alternatives 2 through 7 will provide long-term public health protection through combined actions of removal of contaminants from groundwater system and monitoring to detect potential migration toward supply wells.

- no compliance with ARAR's;
- no active reduction of toxicity, mobility or volume;
- no short-term effectiveness;
- no long-term effectiveness and performance;
- no acceptance by the community or the State;
- no active protection of human health and the environment.

Although this alternative would be capable of implementation and was the least costly of the alternatives, it would not achieve any adequate compliance with the above listed criteria and therefore it was not a remediation acceptable to the State.

Alternatives 2, 3, 4, 5, and 6 were all active pumping alternatives which differed in the location where recovered water would be discharged and in some instances the location and type of the facility where the recovered water would be treated (although all treatment facilities would be required to achieve the same stringent air and water discharge criteria). Because all these alternatives would employ the same groundwater well contaminant and recovery system as the recommended Alternative No. 7 and be required to meet the same cleanup and monitoring requirements, they were equal with Alternative No. 7 for the following criteria:

- all these alternatives comply with ARAR's to the same degree, and

- all these alternatives reduce the toxicity, mobility, and volume of contamination to the same degree.

Each of the Alternatives 2-6 did not comply with the other criteria as fully as Alternative No. 7. The following comparison sets forth these deficiencies.

2. Alternative No. 2

Alternative No. 2 was equal to No. 7 in compliance with the criteria of meeting long-term effectiveness and performance. However, since Alternative No. 2 required the permitting and building of a Resource Recovery Facility ("RRF") on Landfill property, it was less effective than Alternative No. 7 in meeting the following criteria:

- Its short-term effectiveness was uncertain because the process to permit and build an acceptable RRF at this site was anticipated to be a long process with an uncertain outcome. The State therefore refused to recommend an alternative which relied on the existence of a RRF at some unknown date in the future;
- The implementability of this alternative was subject to the same uncertainty;
- The community, which has attended public meetings, and made comments on the FS, does not want a resource recovery facility at this site;
- Although the groudwater recovery system would be as protective of human health and the environment

as Alternative No. 7, it is uncertain, because no data currently exists on what effect the discharge from the RRF would have on health and the environment;

- The State, for the above reasons, has refused to accept this alternative;
- Although the cost of Alternative No. 2 was presented in the FS as less than Alternative No. 7, the main reason was that the cost of the RRF ($150 million) was not included in the cost estimate. Since Alternative No. 2 did not achieve the same degree of compliance with all criteria as No. 7, it was not recommended.

3. Alternative Nos. 3 and 4

Both Alternatives 3 and 4 required some discharge to the Nassau County Sewer Treatment Plant (No. 3 calls for total discharge to the sewer facility and No. 4 would send the excess not used by the proposed RRF).

Alternative No. 4, since it relied on the existence of the RRF has all the deficiencies and was rejected for all the same reasons set forth for Alternative No. 2. In addition, it was also not acceptable to the State because the discharge to the sewer facility would contravene water conservation requirements for Long Island sole source aquifers set forth in 6 NYCRR 602.

Alternative No. 3 which called for total discharge to the Nassau County Sewer Treatment Plant was equal to Alternative 7 on all criteria, except as set forth below:

- Nassau County, in meetings with the State and Town, stated the treatment plant did not have capacity to handle 1.5 million gallons of discharge water and therefore the County would not approve a permit to accept this water. If a permit were to be obtained, it would need to be accomplished through the institution of administrative or legal proceedings (see Walsh letter dated July 25, 1986 contained in the administrative record);
- Secondly and, more importantly, the removal of 1.5 million gallons a day (without replacement) from this portion of the Long Island sole source aquifer would contravene the water conservation requirements set forth in 6 NYCRR 602.

For these reasons, neither Alternative No. 3 or No. 4 were appropriate for recommendation.

4. Alternative No. 5

Alternative No. 5, which called for discharge in Bethpage State Park downgradient of the proposed recovery wells was equal to Alternative No. 7 on all criteria, except as noted below:

- Alternative No. 5 was not as protective of health and the environment:

- The only discharge location downgradient of the recovery wells which would not interfere with the pumpage and hydraulic control of those wells and which would not be placed in plumes of contamination to the east and west of the Landfill (thus potentially interfering with future investigations and remediations of those sites) was in Bethpage State Park approximately 1000 feet upgradient of Farmingdale public drinking supply wells. Although the cleanup criteria would require the discharge water to meet New York State groundwater standards and federal drinking water guidelines, the discharge water would nonetheless contain low levels of contamination. In addition, the possibility of a temporary treatment system malfunction might result in higher contamination discharge levels until system shut down. In view of the fact that Alternative No. 7 provided a discharge location which would contain all contamination within the recovery system, Alternative No. 5 was not as protective of the human health and environment as No. 7;
- The treatment system for No. 5 would be located in Bethpage State Park, a public golf course. The treatment system for Alternative No. 7 would be located in the middle of the Landfill property at a point furthest from public exposure.

Although the air discharges from these treatment facilities would meet all State and federal standards and the risk to the public would be low, the fact that the treatment facility for Alternative No. 5 would be located on a public facility made it less protective of the public health than Alternative No. 7.

- Since both the treatment facility and the discharge basin (covering approximately 5 acres) would be on the State Park, it would require the obtaining of permits or easements, and might require the substantial reconstruction of the public golf course. The obtaining of such legal access and restructuring of the golf course, while not impossible, would certainly delay and impede the remediation.
- At the formal public meeting, the group of citizens who attended and commented on the recommended Alternative No. 7 expressed a preference for Alternative No. 5 over No. 7. The State responded to this comment at the meeting and in a more detailed fashion in its written responses. Those responses are set forth specifically in the Public Responsiveness Summary. In sum, these comments came from citizens and public officials who lived close to the Landfill and who drank from or were responsible for the

Plainview public drinking well field No. 5. They expressed two main concerns, first that Alternative No. 7, since it called for treatment and discharge on the Landfill would aid the Town in its proposed application for a RRF at the Landfill site and secondly, that Alternative No. 7 called for discharge of groundwater closer to the Plainview public drinking supply (which is upgradient of the proposed recharge) than Alternative No. 5, which called for discharge downgradient of the recovery wells (but closer to and upgradient of Farmingdale Public Drinking Wells). The State found both concerns to be unpersuasive. A summation of the the State's responses is set forth below:

- The permit process for the RRF is totally separate and distinct from the remediation program set forth by Alternative No. 7 and would fail or succeed solely on its own merits. It is not aided or helped legally or practically by the acceptance and implementation of Alternative No. 7;
- Groundwater recharge mounding calculations showed that Alternative No. 7 recharge water would not affect the Plainview Well Field #5. Monitoring would be performed to confirm those calculations;
- Since Alternative No. 7 would not affect

Plainview Public Wells, it was more protective of health and the environment than Alternative No. 5, which would discharge contamination outside the containment system and 1000 feet upgradient of Farmingdale Public Drinking Wells.

- Alternative No. 5 would be less costly than Alternative No. 7, but in view of the fact that it would not achieve the same level of protection for human health and the environment as Alternative No. 7, the cost factor was not considered determinative. For these reasons, Alternative No. 5 was not recommended.

5. Alternative No. 6

Alternative No. 6, which located the treatment facility in Bethpage State Park and called for the discharge of the recovery water into the storm sewer system which flows into Massapequa Creek, was equal to Alternative No. 7 in compliance with all criteria, with the exception of the following:

- Alternative No. 6, since it called for the removal without replacement of 1.5 million gallons of water per day from this portion of the Long Island sole source aquifer, like Alternatives No. 3 and 4, would be in contravention of 6 NYCRR Section 602.
- Alternative No. 6 was not as protective of human

health and the environment as Alternative No. 7 because, like Alternative No. 5, the treatment facility would be located in Bethpage State Park, thereby providing some level of contaminant exposure to the public. Also, like Alternative No. 5, the discharge water, although only slightly contaminated, would be placed outside the groundwater recovery well containment system in an area accessible to the public.

- Although Alternative No. 6 was less costly than Alternative No. 7, since it would not achieve the same level of protection of health and the environment, the cost factor was not considered determinative.

C. Reasons for Recommendation and Selection of Alternative No. 7 for Remediation of the Old Bethpage Landfill.

Alternative No. 7 was recommended and ultimately selected because it rated equal to or better than all other alternatives for the nine evaluation criteria set forth in the NCP. The analysis of that comparison is set forth below.

1. Applicable or Relevant and Appropriate Requirements

Alternative No. 7 is designed to meet all Applicable or Relevant and Appropriate Requirements (Table 1) as follows:

(a) The current plume will be contained and hydraulically controlled by the groundwater recovery well system. The plume will not migrate past the hydraulic barrier while pumping occurs. This barrier will protect the public drinking wells downgradient of the recovery wells. The area between the recovery wells and the public supply wells will be protected from any further contaminant migration which would cause the groundwater in that area to exceed New York State groundwater standards and Drinking Water Guidelines.

(b) The plume itself will be cleaned to New York State Standards and Drinking Water Guidelines or to a zero-slope condition (defined in the RAP) if after 5 or more years of pumping no significant contaminant reduction is occurring and no other requisite remedial technology (defined in the RAP) exists to further reduce the contamination.

(c) The discharge of the recovered groundwater from the treatment facility will meet New York State Groundwater Standards and Drinking Water Guidelines.

(d) The air discharge from the stacks of the treatment facility will meet New York State Air Guide No. 1 Guidelines for the Control of Toxic Ambient Air Contaminants.

(e) The cap will be designed to meet all ECL (6NYCRR Part 360) requirements including 10^{-7}

permeability.

- (f) The gas collection system will maintain a -1 pressure at all monitoring points and be sampled for volatile organic chemicals at agreed monitoring points to demonstrate that the gas recovery system is not allowing the escape of volatile organic chemicals from the Landfill.

2. Reduction of Toxicity, Volume, and Mobility

Alternative No. 7 will reduce the toxicity and volume of contamination within the plume to New York State Groundwater Standards and Guidelines, or to a zero slope condition, if one exists following 5 or more years of pumping and the application of requisite remedial technology. In other words, the remediation will reduce the toxicity and volume of contamination in this plume to the full extent feasible using the most appropriate technology now in existence (i.e. pump and treat) and requisite technology in the future, if required. Alternative No. 7 will completely reduce the mobility of the plume because it is required to stop, through hydraulic control, its migration, until the cleanliness criteria are met. In addition, the capping of the Landfill will mitigate the production of Landfill leachate, thus further reducing the toxicity, volume, and mobility of the plume. Finally, the gas collection system reduces the mobility of gases from the Landfill by preventing their migration off-site.

Eventually, when biodegradation is complete, gases will cease to be produced in the Landfill.

3. Short-Term Effectiveness

Alternative No. 7 can be implemented within approximately 2 years and will be immediately effective in preventing plume migration and reducing the toxicity and volume of contamination in the plume. Capping of the Landfill which also can be implemented within two years will have the same immediate effect. There are no short-term risks associated with the implementation of Alternative No. 7.

The gas collection program, already in place, has demonstrated its short-term effectiveness in controlling Landfill gas migration and reducing the toxicity and volume of the Landfill gases.

4. Long-Term Effectiveness

Alternative No. 7 is an effective long-term remedy which would result in the protection of public water supplies and the permanent restoration of the aquifer to the lowest possible, technologically achieveable, cleanliness standards.

Long-term effectiveness will require continued operation, maintenance and monitoring of the remedial systems to insure compliance (i.e., hydraulic control, gas collection and capping) with ARARs (both at termination and during post-termination periods), as set forth in the RAP.

5. Implementability

Alternative No. 7 can be readily implemented. It does not depend on innovative technology. The systems to be used are reliable and easily available. There are many competent and dependable companies capable of installing and maintaining this equipment.

It does not present the possibility of delay due to insititutional problems, such as difficulty in obtaining permits or easements.

6. Cost

Alternative No. 7 is the most expensive of the alternatives evaluated. The cost is estimated to be $7,045,000 for capital and annual operating expenditures. This does not include land costs or labor expenses for operation and maintenance.

Alternative No. 7, in addition to meeting ARARs, is the most protective of health and the environment and does not contravene other New York State environmental policies, particularly the water conservation policies of Article 15 of the ECL and regulations promulgated thereunder at 6 NYCRR 602. In addition, although the equipment and installation costs for Alternative No. 7 are more costly than the other alternatives, it does not present some of the legal and technical costs such as the expenses for obtaining permits and easements (e.g., Alternatives Nos. 3, 5, and 6) which might become necessary, under some of the other alternatives.

7. Community Acceptance

The members of the public and public officials who appeared at the public meetings and made comments supported the pump and treat remediation, capping program, and the gas collection program.

Some community members and public officials expressed their preference for Alternative No. 5 over Alternative No. 7. A summary of those comments and the State's responses is set forth in Section III.B.4 supra. A full discussion of those comments and the State's responses is found in the Public Responsiveness Summary attached herewith.

In sum, the State has carefully reviewed Alternative 5 and finds it less protective of human health and the environment than Alternative No. 7.

8. State Acceptance

The State of New York is lead enforcement agency on this matter and is selecting Alternative No. 7 in conjunction with the remedial programs already in place and set forth in the RAP as the appropriate remediation for the Site.

9. Overall Protection of Human Health and the Environment

Alternative No. 7, in conjunction with the remedial programs in place and as set forth in the RAP, is fully protective of human health and the environment. This remediation is designed to limit all routes of contaminant exposure from the landfill and to eventually reduce that contamination to or below ARARs levels. All air and water discharges from remediation system components will be within APARs. The RAP and the proposed Consent Decree will require that these programs will be operated, maintained, and monitored to insure compliance with all these requirements.

D. Public Participation in Development of the Recommended/Selected Alternative

The first meeting with the public on this matter was held in 1983. Representatives of the Department of Law (DOL) and the Department of Environmental Conservation met with the public and public officials to explain what was then known about chemical sampling at the Landfill and the types of investigation and programs planned for the future. Two meetings were held, one on August 11, 1983 and one in early 1984. The first was attended by approximately 30 people, the second by approximately 100. Initial contacts with community groups and interested public officials were made at these meetings. Groups and individuals were encouraged to telephone the Attorney General's office to ask questions and make comments. Telephone numbers and names of state representatives were supplied for this purpose. The public was informed that data existed with respect to this site and that such data was available for review. During 1983 and 1984, the public contacted the Department of Law by telephone calls and letters on numerous ocassions. DOL responded to oral comments orally and written comments in writing.

The data was reviewed by members of the public and press. During this time period, the State was negotiating with the Town for a Remedial Investigation of the site. Many comments from the public and public officials were included in the investigation program. For example, the public requested that the State take split samples from the investigation and have them analyzed by an independent lab. This was included as part of the investigation program.

The negotiations resulted in a proposed Interim Consent Decree between the State and the Town of Oyster Bay. That Interim Consent Decree provided for the Remedial Investigation of the plume of groundwater contamination emanating from the site, the preparation of a Remedial Feasibility Study for the site, and a commitment by the Town to perform a remedial program in compliance with federal, state, and local law and regulations. The Interim Consent Decree also required the Town to complete a portion of the capping program then underway and to continue and maintain the existing gas collection program.

The public was provided with these documents and initially given approximately 30 days to comment. Copies of these documents were delivered to public officials and public groups who had been present at the public meetings. These comments and the State's responses are found in the administrative record. After the public comment period was complete, U.S. District Court Judge Charles Sifton approved the Interim Consent Decree.

During the course of the Remedial Investigation, there was periodic contact between the public and the Attorney General's office. A meeting was held with members of the public in Two World Trade Center in the spring of 1985. A number of topics concerning the Landfill, including closure, plans for expansion, and the Remedial Investigation, were discussed. Periodically, reports and results of the Remedial Investigation were also announced to the public through the news media. In addition, the chemical data were made available to the public at the offices of the Attorney General. Legal and technical representatives of the State discussed the meaning of the data with members of the public who came to review the data. During this time period, DOL responded to telephone questions and comments orally, and written comments and questions in writing.

On July 15, 1987 the Remedial Action Feasibility Study ("FS") was made available to the public. A public meeting was held on July 23rd to provide the public a detailed explanation of the Remedial Investigation; an analysis of the results of that investigation; and a description and explanation of the FS and its preparation process. The meeting also provided the public with an initial opportunity to ask questions and provide initial comments on the RI and FS. A second formal public meeting was held on September 10, 1987. The purpose of that meeting was to obtain formal comments on the FS and recommended Remedial Alternative No. 7. The State also explained the procedure for the submission of written comments. The State responded to oral comments at the meeting to the extent possible. The State responded to all significant comments, both oral and written, in writing. These comments and the State's responses are set forth in the Public Responsiveness Summary. Transcripts of both meetings are available in the administrative record.

Both meetings were noticed in local newspapers. (See Public Responsiveness Summary). Certain public officials and members of the public who represented known citizens groups were also notified by letter and/or telephone.

E. Participation of the Responsible Parties In the Development of the Recommended/Selected Alternatives

The corporate defendants were provided copies of the Interim Consent Decree and the plan for Remedial Investigation on May 1, 1984. The Interim Consent Decree, in addition to setting forth the plan for Remedial Investigation, set forth the requirements for development of the Remedial Feasibility Study, the partial capping program, and the continuation of the gas recovery program. As per the directive of Judge Sifton, the U.S. District Judge presiding over the litigation, the State was requested to submit the Interim Consent Decree to the Court by motion. This was done on July 5, 1984. The defendants and the public were given to July 19 to submit papers or comments in response to the motion. The comments of the defendants are set forth in the administrative record. The defendants made no significant objection or opposition to the work set forth in the Interim Consent Decree and the RI or to its implementation.

As the work under the RI progressed, the corporate defendants were provided the data results from that work. They were provided a full and detailed explanation of the RI and the findings of that investigation.

When the third-party defendants were brought into the litigation, they were also provided access to the data from the RI and given a full and detailed explanation of the RI and its findings. Copies of the completed RI were made available to representatives of all defendants and third-party defendants.

Later, the responsible parties were provided an outline of the remedial feasibility study and the comparison of alternatives and projected costs. Settlement discussions were conducted using the projected costs of the various alternatives being evaluated as the basis of the discussions. The various proposed alternatives were discussed in detail. Maps depicting the various disposal and treatment locations were displayed.

The parties were requested to comment on the proposals. Several other meetings which discussed these proposals were held with the responsible parties. Prior to and at each meeting requests for comments were made. All the written questions concerning proposed remediation at the Landfill which were received from the responsible parties are set forth in the administrative record. Questions and comments were responded to orally at the meetings. The responsible parties, defendants and third-party defendants made no significant objection or opposition to the remedial proposals set forth in the outline of the FS.

The final Feasibility Study was provided to the responsible parties in July 1987. The comment period for the FS was approximately 75 days. No comments were received from the responsible parties during the comment period or thereafter.

Attendance sheets and handouts from significant meetings with the responsible parties as well as significant written communication to them concerning the RI/FS are contained in the administrative record.

F. Relationship of the Settlement of the Litigation to the Recommended/Selected Alternatives

The Remedial Action Plan set forth herein which implements Remedial Alternative No. 7 and the other ongoing remedial measures at the the site, has been developed mainly by the State and the defendant Town of Oyster Bay. If the Town agrees to perform the Remedial Action Plan and if the terms of the proposed settlement are agreed to by substantially all parties to the litigation, that proposed settlement would have the effect of resolving the litigation amongst the parties and providing for the full and complete resolution of the remediation of the Landfill under CERCLA/SARA. Therefore, once EPA concurs with the State's formal selection of the appropriate remedial plan for this site, the majority of the parties in the litigation will be in a position to reach agreement on the proposed settlement and perform the RAP.

G. Statutory Findings with Respect to the Recommended/ Selected Alternatives

The Alternative No. 7 and the complementary remedial plans called for in the RAP satisfy the nine evaluation criteria to a greater degree than the other appropriate alternatives examined.

The RAP complies with all ARARs.

Alternative No. 7 ulitizes permanent solutions to the maximum extent practicable as defined by Section 121 of CERCLA. Implementation of this RAP will permanently and significantly reduce the mobility, toxicity, and volume of the wastes at the site.

This RAP provides the greatest degree of short-term and long-term effectiveness and permanence, and eliminates the public health and environmental exposure routes at the Landfill. Protection of human health and the environment on a long term basis is best assured by the RAP and its associated maintenence and monitoring programs and requirements. The State's analysis of the possible risks related to the operation of the RAP (i.e., air and water discharges from the treatment facility) indicate that these risks can be adequately controlled and pose no significant health or environmental exposure risk.

This RAP applies technology which is reliable and available.

Although Alternative No. 7 is the most expensive alternative, it achieves the statutory criteria to a greater degree than any other alternative. Hence, the State and EPA find that the balance of costs versus benefits is tipped in favor of the most expensive alternative.

The State has considered all comments from the community to the maximum degree possible in light of the other factors to be weighed. The State finds no public comment which argues effectively for the selection of an alternative other than Alternative No. 7.

In summary, the State has recommended and by this document the State and EPA select Alternative No. 7 and the complementary remedial programs in the RAP because they are protective of human health and the environment, will attain applicable or relevant and appropriate requirements, are cost effective, utilize permanent solutions to the maximum extent practicable, and will significantly reduce the toxicity, mobility, and volume of waste all as defined by Section 121 of CERCLA.

IV. SELECTION OF REMEDY

Based upon CERCLA, as amended by SARA, and a review of the entire administrative record herein, including without limitiation, the comments of the public, the Remedial Investigation and Feasibility Study, and a detailed evaluation of all the alternatives, the State and EPA have determined by means of this Record of Decision that Alternative No. 7, and the complementary remedial plans set forth in the RAP and detailed above, constitute the selected remedy for this site.

The cost of the groundwater portion of Alternative No. 7 is estimated by the Town to be $7,045,000. The entire remedy, including groundwater remediation and source remedial measures, is estimated by the Town to cost approximately $23,045,000.

APPENDIX I OF ROD ATTACHMENT 2

OBSWDC
Remedial Action Plan

I. DESCRIPTION

A. Introduction

This Remedial Action Plan (RAP) describes the activities undertaken and to be undertaken to restore the quality of groundwater and air in the vicinity of the Old Bethpage Solid Waste Disposal Complex (OBSWDC) which has been affected by contamination from the Old Bethpage Landfill. This RAP provides for the Town of Oyster Bay to implement the following activities in compliance with the terms and conditions of a Final Consent Decree in N.Y.S. v. Town of Oyster Bay et al. 83 Civ. 5357("Consent Decree") to which this plan is attached as Appendix A:

(1) install a system of groundwater recovery wells in the "Area to be Remediated" described in Section I.B herein;

(2) operate and maintain these groundwater recovery wells, to create a hydraulic barrier as defined in Section I.D and to attain specified Groundwater Criteria set forth in Section III.B.1 or demonstrate that the Zero Slope Condition and other Termination Criteria of Section III.B.2 have been met;

(3) treat and discharge the extracted and collected groundwater in compliance with the groundwater and air discharge requirements set forth in Sections I.E and I.F;

(4) complete, maintain, and monitor the current capping and gas and leachate collection programs as per the closure requirements of New York State Regulation 6 NYCRR Part 360 and the requirements of the Consent Decree and Sections I.G, I.H and I.I herein;

(5) carry out and comply with the requirements for sampling, analysis and health and safety set forth in Sections IV, V and VI, respectively.

The RAP is preceded by several studies which defined the nature and extent of groundwater contamination and examined remedial alternatives:

"Old Bethpage Landfill, Groundwater Monitoring Program, Phases 1 & 2," Lockwood, Kessler & Bartlett, Inc., 1981.

"Comprehensive Land Use and Operations Plan, Old Bethpage, Solid Waste Disposal Complex," Lockwood, Kessler & Bartlett, Inc., 1983.

"Groundwater Monitoring Data Report," Lockwood, Kessler & Bartlett, Inc., 1984.

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"OBSWDC Offiste Exploratory Drilling and Monitoring Well Installation Program, Old Bethpage, Long Island, New York," Geraghty & Miller, Inc., August 1985.

"OBSWDC Offsite Groundwater Monitoring Program, Old Bethpage, Long Island, New York," Geraghty & Miller, Inc., September, 1986.

"Remedial Action Feasibility Study, Landfill Leachate Plume, Old Bethpage Solid Waste Disposal Complex, Town of Oyster Bay, New York", Lockwood, Kessler & Bartlett, Inc. and Geraghty & Miller, Inc., July, 1987.

"OBSWDC Aquifer Test For Evaluating Hydraulic Control of Leachate Impacted Ground Water, Old Bethpage, Long Island, New York", Geraghty & Miller, September 1987.

B. Area to be Remediated (the "plume")

The 1986 report by Geraghty & Miller, Inc. identified offsite areas where groundwater quality had been affected by contamination from the Landfill. The RAP provides for hydraulic containment of the plume by a system of groundwater recovery wells located at the area defined by the leading edge of the plume of volatile organic chemicals ("VOCs"). The area to be remediated (the "plume") is delineated in plan view on Figure 1, and is shown in cross-section on Figure 2. The recovered water will be piped to a treatment plant and ultimately recharged through a combination of leaching wells and the recharge basin located northwest of the Old Bethpage Landfill as shown on Figure 3. This system is described in detail in the following sections.

C. Groundwater Recovery Well System

Based upon previous modeling studies and a pilot pump test conducted in the summmer of 1987, the proposed number and location of groundwater recovery wells to effectuate hydraulic control of the area to be remediated is set forth in Figure 3. The engineering details and design specifications for this system will be set forth in the Final Design Plan to be submitted pursuant to Section J. The Town of Oyster Bay will complete the Final Design Plan and installation of the groundwater recovery system as set forth in the schedule in Section K. The Final Design Plan and the installed recovery system is subject to final State approval as per paragraph XV of the Consent Decree.

Reproduced from best available copy.

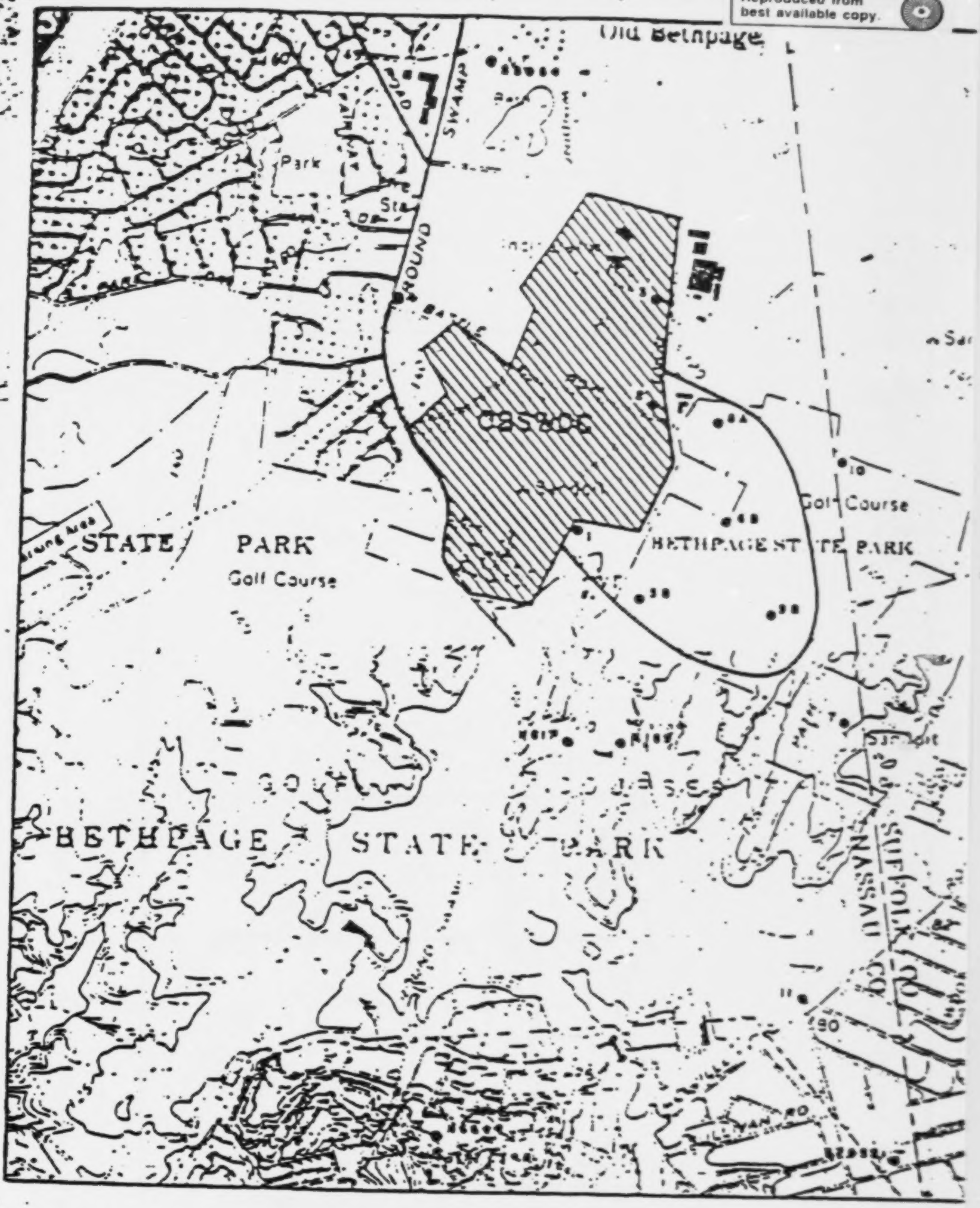
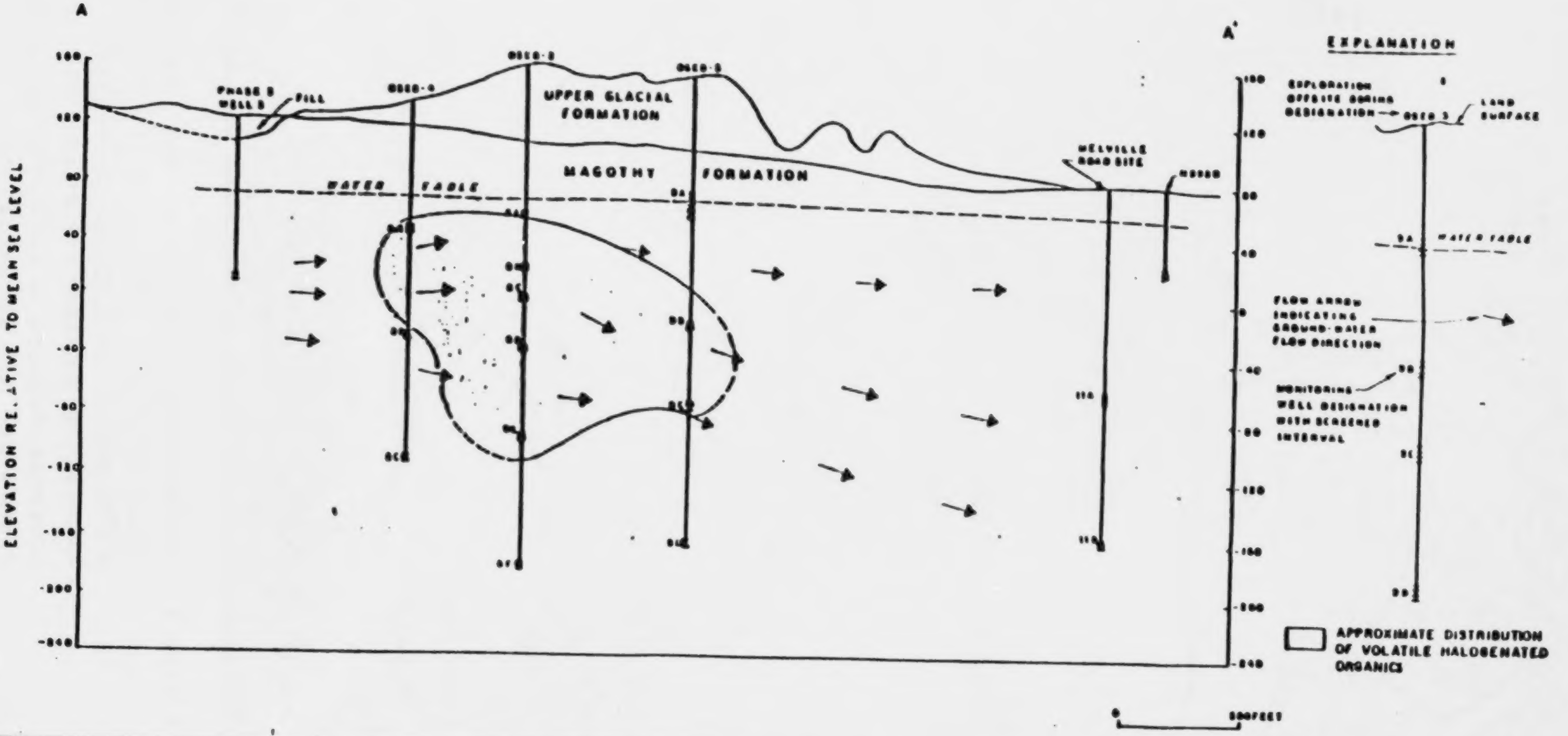

Old Bethpage
SWAMP
Park
ROUND
STATE PARK
Golf Course
Golf Course
BETHPAGE STATE PARK
GOLF COURSE
BETHPAGE STATE PARK
NASSAU CO
SUFFOLK CO
10
90

Figure 1 APPROXIMATE DISTRIBUTION OF VOLATILE HALOGENATED ORGANICS (VHOs) AND LANDFILL LEACHATE IN EXCESS OF ARARs

PREPARED BY GERAGHTY & MILLER INC., FOR LOCKWOOD, KESSLER, & BARTLETT, INC., & TOWN OF OYSTER BAY, OLD BETHPAGE, NY

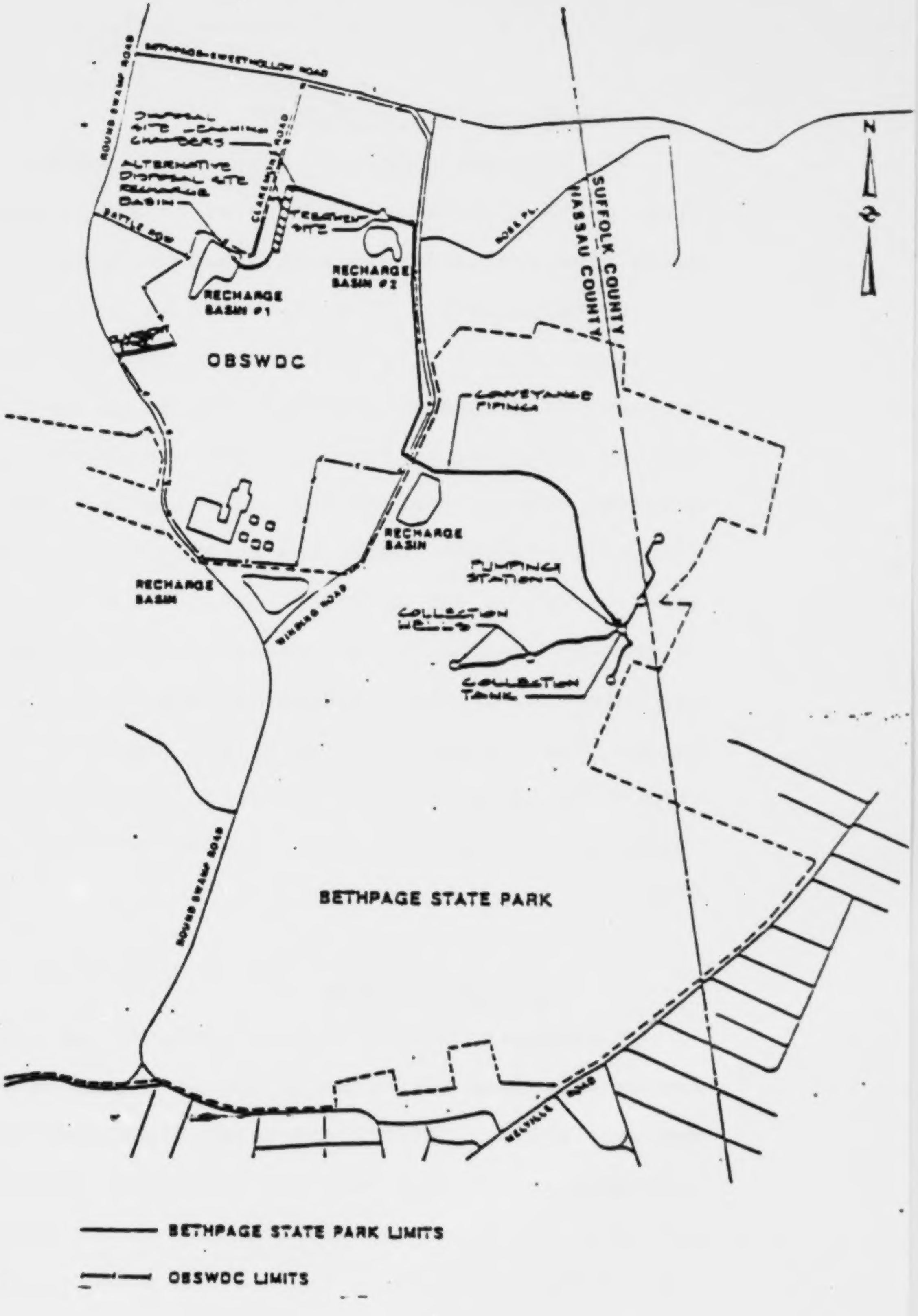

A
A'
ELEVATION RELATIVE TO MEAN SEA LEVEL
160
120
80
40
0
-40
-80
-120
-160
-200
-240
PHASE 3 WELL 3
FILL
OSEB-4
OSEB-2
OSEB-3
UPPER GLACIAL FORMATION
MAGOTHY FORMATION
WATER TABLE
MELVILLE ROAD SITE
EXPLANATION
EXPLORATION OFFSITE BORING DESIGNATION
OSEB 3
LAND SURFACE
WATER TABLE
FLOW ARROW INDICATING GROUND-WATER FLOW DIRECTION
MONITORING WELL DESIGNATION WITH SCREENED INTERVAL
APPROXIMATE DISTRIBUTION OF VOLATILE HALOGENATED ORGANICS
0
500 FEET

APPROXIMATE VERTICAL DISTRIBUTION OF VOLATILE HALOGENATED ORGANICS (VHOs) ALONG CROSS SECTION A-A'

Prepared by Geraghty & Miller, Inc for

LOCKWOOD, KESSLER, AND BARTLETT, INC.
AND THE
TOWN OF OYSTER BAY
Old Bethpage, New York

Figure 2


BETHPAGE-SWEETHOLLOW ROAD
ROUND SWAMP ROAD
DISPOSAL SITE LEACHING CHAMBERS
ALTERNATIVE DISPOSAL SITE RECHARGE BASIN
BATTLE ROW
TREATMENT SITE
RECHARGE BASIN #1
RECHARGE BASIN #2
ROSE PL.
SUFFOLK COUNTY
NASSAU COUNTY
N
OBSWDC
CONVEYANCE PIPING
RECHARGE BASIN
RECHARGE BASIN
PUMPING STATION
COLLECTION WELLS
COLLECTION TANK
ROUND SWAMP ROAD
BETHPAGE STATE PARK
MELVILLE ROAD
BETHPAGE STATE PARK LIMITS
OBSWDC LIMITS

FIGURE

LSB

RECOMMENDED
REMEDIAL ALTERNATIVE

D. Hydraulic Containment

The proposed hydraulic containment system, subject to final State approval, will consist of sufficient recovery wells (the preliminary design based on previous modeling and monitoring calls for five (5) wells as shown on Figure 3), each pumping at a rate necessary to maintain and control the movement of groundwater in the area to be remediated and to provide a barrier to further plume migration. Sufficient drawdown will be created and maintained to establish a hydraulic gradient toward the recovery wells. Monitoring of water levels as set forth in Section II.A will be conducted to demonstrate that a sufficient drawdown is being maintained to create a hydraulic barrier to contain the plume. The procedure to verify the amount of drawdown sufficient to create such a barrier and to confirm that this drawdown is being maintained is also set forth in Section II.A.

E. Treatment System

A treatment system will be designed and installed to remove VOCs from the water collected by the remedial recovery wells. The air and water discharges from this treatment system will meet all applicable federal, state, and local air discharge requirements as set forth on Table 1 and all applicable State Pollution Discharge Elimination

TABLE 1
APPLICABLE AIR DISCHARGE REQUIREMENTS FOR AIR STRIPPING TREATMENT SYSTEM*

Constituent	-Ambient Air Concentrations- NYSDEC Annual Guideline (ug/m3)
Vinyl Chloride	4.00E-01
Freon 13	3.00E-02
Methylene Chloride	1.17E+03
1,1-Dichloroethane	2.70E+03
1,2-Dichloroethene	2.63E+03
Chloroform	1.67E+02
1,1,1,-Trichloroethane	3.80E+04
Carbon Tetrachloride	1.00E+02
1,2-Dichloroethane	2.00E+01
Trichloroethylene	9.00E+02
1,2,-Dichloropropane	1.17E+03
Bromodichloromethane	3.00E-02
Tetrachloroethene	1.12E+03
Chlorodibromomethane	3.00E-02
Bromoform	1.67E+01
Benzene	1.00E+02
Toluene	7.50E+03
Ethyl Benzene	1.45E+03
(m) Xylene	1.45E+03
(o&p) Xylene	1.45E+03
(m) Dichlorobenzene	3.00E-02
(o) Dichlorobenzene	1.00E+03
(p) Dichlorobenzene	1.50E+03
Chloroethane	5.20E+04
1,1,-Dichloroethylene	6.67E+01
Chlorobenzene	1.17E+03
Ammonia	3.60E+02

---

* Established per New York State Department of Environmental Conservation Air Guide No. 1 for Toxic Air Contaminants. If any federal National Ambient Air Quality Standards or National Emission Standards for Hazardous Air Pollutants are promulgated which are more stringent than these State guidelines, the more stringent standard shall apply.

System (SPDES) and Technical and Operational Guidance Series (TOGS) limitations set forth in Table 2.

Initially, the treatment system will consist of an air stripping unit designed to meet the specified discharge criteria.

The initial air stripping tower will be located as shown on Figure 3 and will have the conceptual design characteristics as shown on Table 3. The precise location within the area shown and the specific operational design characteristics will be set forth in the Final Design Plan to be submitted pursuant to Sections J and K, subject to State approval.

If after two (2) months of operation (after an initial equipment shakedown period), the air stripper treatment system does not meet the specified discharge criteria, the Town will be required to add a carbon adsorption unit capable of allowing the system to meet the specified discharge criteria. The Town will also be required to install sufficient iron treatment equipment and/or implement sufficient equipment maintenance procedures to insure that the air stripping equipment operates continuously and efficiently.

The Town will set forth in the Final Design Plan the complete treatment system showing the integration of all the above described units. The Final Design Plan will also set

TABLE 2

GROUNDWATER AQUIFER AND TREATED GROUNDWATER DISCHARGE REQUIREMENTS*

Inorganics	mg/l
Barium	1.0
Cadmium	0.01
Chloride	250
Chromium (hex)	0.05
Copper	1.0
Cyanide	0.2
Iron	0.3
Lead	0.025
Magnesium	35
Mangenese	0.3
Mercury	0.002
Silver	0.05
Zinc	5.0
Total Dissolved Solids	500**
Nitrate	10
Sulfate	250
Phenols (total)	0.001

Volatile Organic Compounds (VOCs)	ug/l
Vinyl Chloride	2.0***
Methylene Chloride	50
1, 1 Dichloroethane	50
1, 2 Dichloroethane	0.8
1, 1 Dichloroethene	0.07
1, 2 Dichloroethene (trans)	50
Trichloroethylene	5***
1, 1, 1 Trichloroethane	50
Chloroform	100
Carbon Tetrachloride	5
1, 2 Dichloropropane	50
Bromodichloromethane	50
Tetrachloroethene	0.7
Chlorodibromomethane	50****
Chloroethane	50****
Bromoform	50
Benzene	non-detect
Toluene	50
Xylene (all isomers)	50

Table 2 con't.

Ethylbenzene	50
Chlorobenzene	20
Dichlorobenzene	
ortho-and para-	4.7
all isomers	50****
Total VOCs (for groundwater)	50
Total VOCs (for discharge)	100

* This list of compounds is not exhaustive of the applicable Standards and Guidance Values. The list represents the most prevalent compounds found at the site. The cleanliness criteria listed herein are Standards and Guidance Values issued by the NYS Department of Environmental Conservation for the protection of Class GA waters found at 6 NYCRR 703 and in the Technical and Operational Guidance Series (TOGs) dated April 1, 1987. If during the course of the remediation additional compounds should be detected, the most stringent of the requirements obtained from these two sources shall apply. For any VOC which does not have a specific Standard or Guidance Value, the applicable limit shall be 50 u/l.

** Federal Standard promulgated by the U.S. Environmental Protection Agency (EPA).

*** For these compounds, the Maximum Contaminant Level (MCL) under the Federal Safe Drinking Water Act is less than the State Standards or Guidance Values and therefore shall apply. Should additional MCLs be promulgated by the EPA, then the most stringent standard shall apply.

**** These compounds do not have a specific State Standard or Guidance Value and therefore the applicable limit is 50 u/l.

TABLE 3

Preliminary Air Stripper Design Data*

Water Flow Rate = 1.5 MGD

Air/Water Ratio = 60/1

Air Flow Rate = 8400 cfm

Liquid Loading Rate = 20 gpm/ft^2

Stripper Diameter = 8 ft.

Air Exit Velocity = 2.8 fps.

Water Temperature = 50 to 60 F

Stripper Ground Elevation = El.140 (approximately)

Stripper Height = 38 ft.

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* Preliminary design data has been established through pilot plant studies and is subject to future modification prior to final design.

forth the proposed procedure and timetable for integrating the additional treatment units in the system, if needed.

In general, these additional treatment units will be installed adjacent to the operating air stripping tower. The need for these units(s) will be established within 60 days of the plant start-up [allowing for a reasonable plant shakedown period agreed to by Town and State] or, if the influent/removal efficiencies of the initial treatment system change in the future, within 60 days of the confirmation of the failure to meet the specified discharge criteria. The installation of the additional treatment units will be completed within a period of five (5) months from the time that the failure to comply is established. The conceptual design parameters for the iron removal system and the carbon adsorption units(s) are presented in Tables 4 and 5, respectively. The final design parameters will be developed and set forth in the Final Design Plan required by Sections J and K, subject to State approval.

The Town will make all necessary modifications, additions, and adjustments to the treatment system until it meets the specified discharge criteria. The treatment system will not be permitted to operate without State approval for longer than a sixty day period if it fails to meet the specified discharge criteria. Re-start of the system will only be allowed following the implementation of State approved modifications.

TABLE 4

- Preliminary Iron Removal System Design Data*

Water Flow Rate	=	1.5 MGD
Treatment Method	=	Ion Exchange (Magnesium Zeolite or equivalent) followed by pressure filtration
Chemical Feeding	=	Potassium Permagnate Caustic
Configuration	=	3 trains in parallel
Reaction Tank Diameter	=	8 ft.
Reaction Tank Cross Sectional Area	=	50.2 ft^2
Liquid Loading Rate	=	6.97 gpm/ft^2
Reaction Tank Height	=	less than 10 ft.

---

* Preliminary design data has been established by the manufacturer and is subject to future modification prior to final design.

TABLE 5

Preliminary Activated Carbon Adsorption System Design Data*

Water Flow Rate = 1.5 MGD

No. of Carbon Adsorbers = 3 (includes 1 standby)

Configuration = Parallel

Adsorber Diameter = 10 ft.

Adsorber Cross Sectional Area = 78.5 ft^2

Liquid Loading Rate = 6.68 gpm/ft^2

Adsorber Height = less than 20 ft.

Carbon Load = 20,000# per Adsorber

Estimated Useful Carbon Life (to benzene breakthrough) = 1 Year

* Preliminary design data has been established through laboratory bench scale studies and is subject to future modification prior to final design.

F. Discharge System

1. General

The water to be discharged will be conveyed to a series of leaching wells and/or to an existing recharge basin for recharge to the ground. The discharge points will be located west northwest of the landfill area at the Old Bethpage Solid Waste Disposal Complex as shown on Figure 3. The discharge system, whether leaching pools and/or a recharge basin will be designed to accommodate the total daily flow from the recovery wells.

2. Leaching Wells

The leaching wells will be ten feet in diameter and have an approximate effective depth of 25 feet. A typical section of the proposed well is shown on Figure 4. The final quantity and location of the wells will be determined, subject to State approval as part of the Final Design Plan required under Sections J and K. As per the schedule set forth in Section K, prior to completion of the Final Design Plan, soil borings will be obtained and percolation tests will be conducted to establish the exact number of wells and the expected percolation rates. Should a sufficient area containing well-drained subsurface soils not be available to recharge the discharge flow, the recharge basin, described in the next paragraph, will be used for the overflow.

3. Recharge Basin

Recharge Basin No. 1, as shown in Figure 3, is located

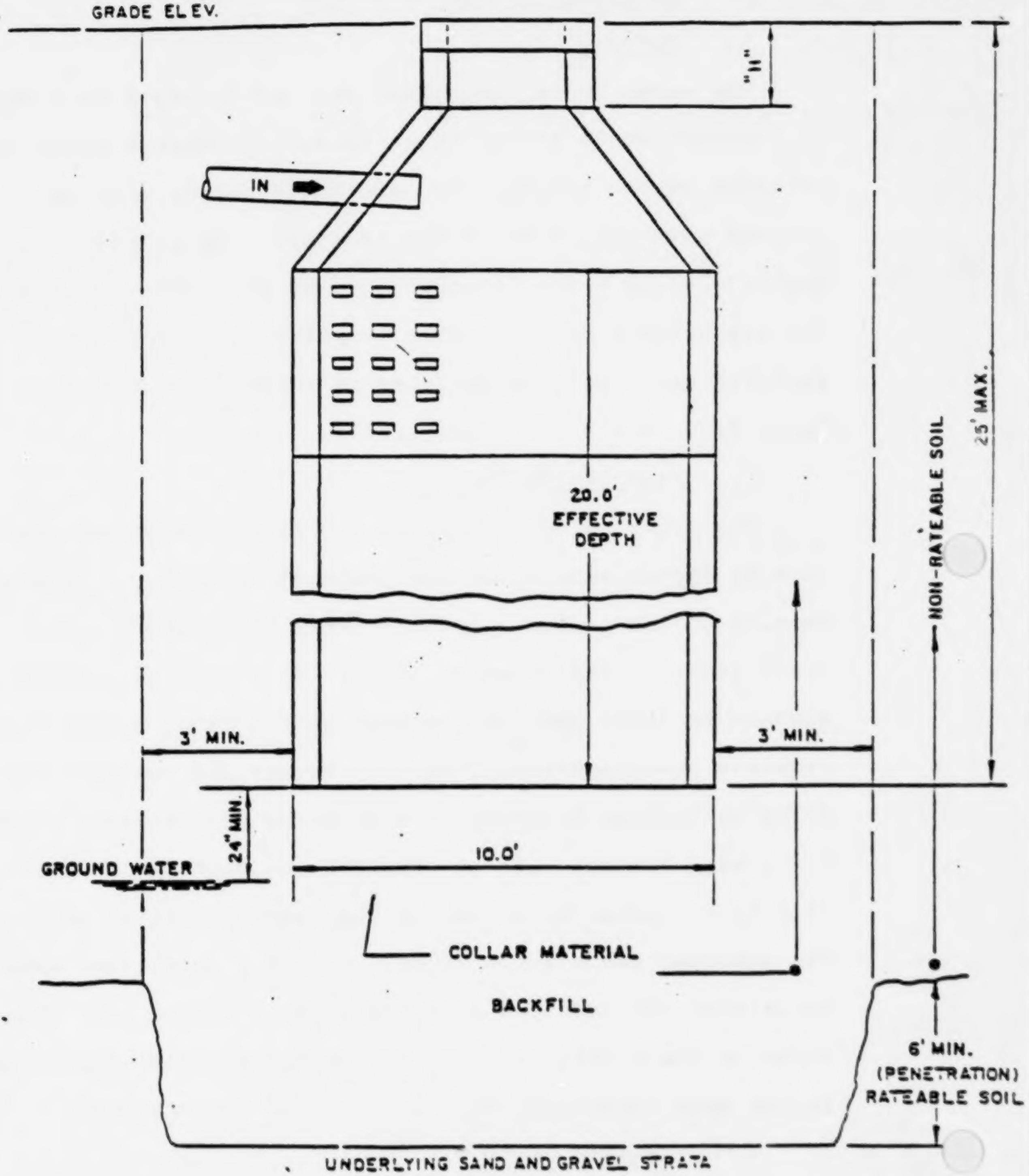

GRADE ELEV.
"H"
IN
25' MAX.
NON-RATEABLE SOIL
20.0' EFFECTIVE DEPTH
3' MIN.
3' MIN.
24" MIN.
10.0'
GROUND WATER
COLLAR MATERIAL
BACKFILL
6' MIN. (PENETRATION) RATEABLE SOIL
UNDERLYING SAND AND GRAVEL STRATA

FIGURE 4

PROPOSED LEACHING WF
CROSS SEC

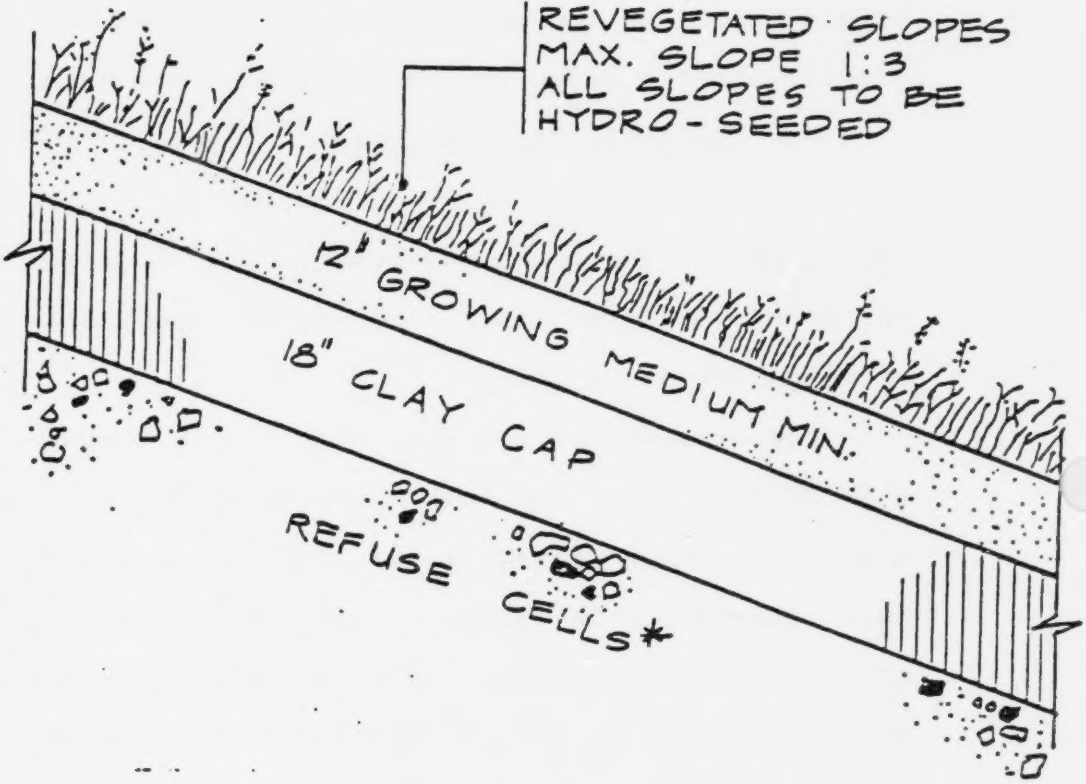
to the west of the landfill area. The basin currently is under construction. The Town will design and construct the basin with a capacity sufficient to handle all local runoff and the flow from the recovery wells. Any water that cannot be discharged to the ground through leaching wells will overflow to the basin for recharge into the ground.

G. Landfill Cap Completion

Approximately 29 acres of the landfill area has already been capped. The remaining portion will be capped as per the schedule in Section K (commencing immediately after signing Consent Decree).

The capping program will comply with the provisions of 6 NYCRR Part 360. The lower portion of the cover must be of a material which restricts infiltration to the equivalent of that achieved by 18 inches of clay at hydraulic conductivity of 10^{-7} cm/sec or less. Soils suitable for plant growth will be applied on top of the clay layer to a thickness of 12 inches. All areas will be hydroseeded (the simultaneous application of water, seed and other specified components by means of a pump or spray) and side slopes are, to the extent practical, to be 3 to 1 or less as long as a stable side slope is maintained. An existing typical cap section is shown in Figure 5.

The capping program and the final grading are designed and will be constructed in coordination with stormwater


REVEGETATED SLOPES
MAX. SLOPE 1:3
ALL SLOPES TO BE
HYDRO-SEEDED
12" GROWING MEDIUM MIN.
18" CLAY CAP
REFUSE CELLS*

* DESIGN WILL INCLUDE GAS VENTING AS NECESSARY

FIGURE 5

LKB

OBSWDC EXISTING
TYPICAL CAP SECT

control systems, service access roads, earth benches, and gas control facilities.

The capping will be completed within months of the initiation of the work. It involves the following steps:

- surveying the completed area;
- regrading to attain, to the extent practical, slopes that are 3 horizontal to 1 vertical or less as long as a stable side slope is maintained;
- application of a cap to reduce infiltration of precipitation into the fill;
- application of growing medium soil over the impervious cap;
- revegetation of slopes by hydroseeding a mixture of seed, water, fertilizer and adhesive mulch; and
- other landscaping as necessary such as screen planting at base, and plateau planting of young trees, shrubs and grasses.

Confirmation of compliance with the cap requirements will be confirmed as set forth in RAP Attachment 1.

H. Landfill Gas Collection System

Since 1979, the Town has implemented programs to prevent offsite migration of landfill gas at OBSWDC. A perimeter landfill gas collection system has been installed at the OBSWDC under four separate construction contracts. The system is comprised of twenty three (23) gas recovery wells, six thousand five hundred (6,500) feet of collection header and three condensate collection wells. The mechanical portion of the system consists of two independently driven blower packages with a combined flow rate capacity of nearly 1800 cubic feet/minute; condensate separation equipment; safety devices and a high temperature gas incinerator.

Pending approval of its application to dispose collected condensate through the Nassau County Sanitary Sewer System, the condensate may be discharged pursuant to its current SPDES permit. If the Nassau County Sanitary Sewer Permit is not approved, the condensate shall be treated in the treatment system pursuant to Section E and discharged pursuant to the discharge criteria pursuant to Section F.

As part of this remedial program the Town will continue to operate and maintain this gas collection system in compliance with the requirements of 6 NYCRR Part 360 and maintain a zero percent methane gas migration limitation at the Landfill boundary. In order to demonstrate that compliance, the Town will conduct the monitoring program described in the Lockwood, Kessler and Bartlett April 1987 report entitled "1986 Annual Report: Summarizing the Status of Landfill Gas Monitoring Programs and the Establishment of the Zero Percent Gas Migration Limitation at the Old Bethpage Landfill." In addition, the Town will conduct the Supplemental Gas Monitoring Program set forth in Attachment

2. The Town will expand and modify this gas collection system as required to prevent offsite migration of landfill gas and to meet the requirements set forth above.

I. Leachate Collection and Treatment System

Since 1983, the Town has processed leachate at its treatment facility pursuant to a sewer use permit from the Nassau County Department of Public Works. The plant has the capacity to treat up to 50,000 gallons per day for heavy metals and solids, and presently discharges the clear, settled effluent to the County sewer located on Round Swamp Road.

As part of this remedial plan, the Town will be required to continue to operate and maintain its leachate collection, treatment, and disposal system in compliance with 6 NYCRR Part 360 and applicable Nassau County Sewer Use Ordinances.

The Town shall dispose of all sludge generated by the leachate collection system at an offsite location in compliance with all applicable federal, state, and local law and regulation.

J. Preparation of a Final Design Plan

1. Content and Schedule

The Final Design Plan will be prepared and submitted in accordance with the Schedule set forth in Section K. The Final Design Plan will contain the following items: Final engineering design and specifications (including drawings) for the complete program for remediation, including but not limited to the design and specifications for the completion of the capping program, groundwater recovery system, treatment system (including piping), recharge system (including injection wells and basin) and monitoring program as fully described in this RAP.

2. Preparation and Adjustments

Prior to final design, up-to-date aerial photographs, supplemented with field survey data will be obtained to produce the topographic maps of the area. Soil borings will also be collected in the area of the proposed treatment plant for use during the foundations design. Percolation tests of the subsurface soils will also be conducted in the area where treated effluent is to be recharged to aid in the design of those facilities.

The treatment plant design will be made flexible to accommodate changes in the interconnecting piping, if and when additional equipment is required to be installed. The use of temporary piping or hose is anticipated during the initial operation of the treatment plant.

The initial construction phase for the treatment plant will include site clearing and preparation, foundations and utilities installation for the entire project, and construction and installation of the air stripping unit, wellfield, influent piping and recharging facilities. The subsequent construction phase, if required, will include the installation of iron removal and/or carbon adsorption equipment and appurtenances.

K. Schedule of Implementation

[A schedule of activities with corresponding dates shall be set forth herein]

II. MONITORING PROGRAM

A. Hydraulic Monitoring

The effectiveness of the hydraulic containment system in exerting control over the defined area to be remediated will need to be demonstrated by measuring water levels in adjacent monitoring wells. In addition, measurement of water levels will monitor the effects of potential mounding due to recharge of the treated water. Initially, the wells to be measured are: all 23 wells in the offsite Remedial Investigation; all remaining intact Phase I, II and III monitoring wells; the well at Melville Road; the closest Farmingdale public drinking wells and all observation wells installed as part of the remediation, including, e.g., the observation wells for the pump test and the well(s) upgradient of the proposed recharge area. Water levels measured in these wells will be referenced to mean sea level and plotted on a base map, according to depth. Contour lines (indicating areas of equal hydraulic potential) will then be drawn. The limiting flow lines will then be drawn indicating the effective capture zone.

Water levels will be monitored on a monthly basis once the hydraulic containment system becomes operational. Water levels will be measured using a steel tape and chalk. Based on these water level measurements, the pumping rates will be adjusted and the system modified until the required hydraulic barrier is created and maintained.

The determination of when the appropriate hydraulic barrier has been created will be as follows: Based on monthly water level measurements, the Town will demonstrate, subject to State concurrence, that equilibrium has been established in the system. Once agreement is reached as to the establishment of equilibrium, the Town will demonstrate with appropriate data and analysis, subject to the State's concurrence, that drawdown, sufficient to create a hydraulic barrier regardless of seasonal fluctuations, has been established. Thereafter, the Town will maintain that drawdown, unless it is demonstrated by subsequent measurement or sampling that that drawdown being achieved is no longer sufficient or is excessive to create the hydraulic barrier. Then the process of establishing, subject to State concurrence, a pumping rate to achieve the required drawdown number appropriate to attain hydraulic control will be recommenced.

The Town will be required to continue to monitor the recovery system to confirm the effectiveness of the hydraulic barrier under any conditions and to adjust and modify the recovery well system to maintain that barrier until the Termination Criteria are met. In addition, the Town will be required to continue to monitor for recharge mounding effects. However, after the initial determinations of equilibrium and appropriate drawdown are reached, the Town will only be required to provide quarterly potentiometric surface maps (see Reporting Requirements in Section II.D.) and to measure water levels at the five recovery wells; monitoring wells 7B and 9B and/or 9C; OBS-1 and OBS-2; a minimum of three additional monitoring points depending upon the ultimate configuration of the agreed upon capture zone; and the wells upgradient of the propsoed recharge area. Either party, during the course of the operation of the system, may propose that wells for water level measurement may be added, subtracted or substituted.

B. Groundwater Quality and Monitoring

1. Introduction

Monitoring of groundwater quality is required to assess the progress of groundwater cleanup, and to demonstrate whether the Termination Criteria set forth in Section III.A have been met.

2. First Round Monitoring

Once the recovery system has been installed and prior to commencement of pumping, a comprehensive First Round sampling shall be undertaken. The wells to be sampled are all 23 wells in the offsite Remedial Invesigation; all remaining intact Phase I, II, and III observation wells; the well at Melville Road; the closest Farmingdale public drinking wells and all observation wells installed as part of the remediation, including, e.g., the observation wells for the pump test and the well(s) upgradient of the proposed recharge area. A complete priority pollutant analysis (Methods 624, 625 and 200.7 [or other individual metals analysis approved per 40 C.F.R. § 136.3]) and a concurrent library search (to tentatively identify and quantify all peaks with an area equal to or greater than 10% of the nearest internal standard) will be conducted on the samples taken from these wells. In addition, leachate indicators shall be analyzed per Table 6.

3. Quarterly Monitoring

Three months after the First Round sampling described above, a program of Quarterly Monitoring will begin and shall continue until the program for termination monitoring is commenced.

The following wells will be sampled quarterly:

5B
6A
6B
6C
6E
6F
8A
8B
9B
9C
11A
11B
7B

In addition, one pump test observation well (to be selected by the State), and the well(s) installed upgradient of the recharge area will be sampled quarterly. A well (to

Table 6
Analytical Methods

Parameter	Analytical Method	Sample Preservation	Holding Time
Chloride	SM 407 A	None	28 Days
Ammonia	SM 417B, EPA 350.2	Cool to 4°C pH $<$ 2 w/H_2SO_4	28 Days
Iron SM 303B,	EPA 236.1	Field filter, Cool to 4°C, pH $<$ 2 w/HNO_3	6 Months
Hardness	SM 314B, EPA 130.2	Cool to 4°C	6 Months
Alkalinity	SM 403, EPA 310.1	Cool to 4°C	14 Days
pH (measured in field)	SM 423	None	Analyze Immediately
Specific Conductance (measured in field)	SM 205	Cool to 4°C	28 Days
VOCs	EPA 601 and 602	Cool to 4°C	14 Days
Metals and others*	EPA 40 CFR 136.3 (Individual Analyses)	As per Individual method	As per Individual method

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*Aluminum, Copper, Lead, Manganese, Nickel, Sodium, Zinc, Chromium (VI), Chromium, Mercury, Potassium, Magnesium, Calcium, Total Dissolved Solids, Nitrate, Sulfate, Carbonate, Total Kjeldahl Nitrogen, Bicarbonate Alkalinity, Cyanide, Phenols, and Barium.

be selected by the State) for the sampling of leachate parameters only will also be sampled quarterly.

The samples from these wells (except as noted) will be analyzed for the parameters set forth in Table 6 utilizing the analytical methods enumerated in the Table.

Either party, during the course of the operation of the system, may propose that monitoring wells be added, subtracted, or substituted. If the parties cannot agree on these proposals, the disagreement will be resolved pursuant to the dispute resolution mechanism, Section XXXI of the Consent Decree.

4. Termination Monitoring

In order to determine whether the Termination Criteria for the remedial system has been attained, a Termination Monitoring program must be commenced. The recovery well system will be required to operate a minimum of five full years (20 quarters) (unless it is demonstrated that the standards and guidelines have been met at an earlier date) before Termination Monitoring can be commenced. Thereafter the Town may, at any time, request the commencement of the Termination Monitoring Program.

a. Initial Termination Monitoring

After the Town's notification to the State that it will commence Termination Monitoring, an Initial Termination Monitoring duplicating the First Round Sampling Program, set forth in Section II.B.2, will be conducted. All wells will be sampled and analyzed for a complete priority pollutant analysis as also set forth in Section II.B.2.

b. Quarterly Termination Monitoring

After the analytical results from the Initial Termination Monitoring are obtained, quarterly Termination Monitoring will commence. This quarterly monitoring will be conducted for a minimum of two (2) years (eight (8) quarters). The State in its discretion after the Initial Termination Monitoring will determine whether the final year of Section II.B.3 Quarterly Monitoring may be substituted for the first year of Quarterly Termination Monitoring.

The wells to be sampled and the parameters to be analyzed for will be proposed by the Town, subject to State approval.

At a minimum, the wells to be sampled will include the wells sampled for the two years of Quarterly Monitoring immediately prior to the Town's request for Termination Monitoring. At a minimum, the parameters analyzed for will be those set forth in Table 6 and any that were added or substituted in the last two years of Quarterly Monitoring. Parameters identified in the Initial Termination Monitoring which could affect the ability of the Town to meet Termination Criteria will also be required on the list of parameters to be analyzed.

Based on two (2) full years (eight(8)quarters) of Termination Monitoring results, the Town may submit a

Petition for Termination which demonstrates that the criteria set forth in Section III.A have been met. If the State agrees with the Town's Petition for Termination, the remedial system may be terminated. If the State and Town cannot agree, disputes will be resolved pursuant to the Dispute Resolution mechanism of Section XXXI of the Consent Decree. The Town will continue to operate the remedial system and conduct Quarterly Sampling until such dispute is resolved or an order from the Court issued. If the Remedial system is shut down, pursuant to either agreement or court order, Post-Termination Monitoring, as set forth in Section II.B.5 will commence.

5. Post-Termination Monitoring

Following termination of the operation of the hydraulic containment system, a Post-Termination Monitoring Program will be undertaken. This program will last a minimum of three (3) years and consist of a semi-annual sampling of the wells sampled during the Quarterly Termination Monitoring Program and an analysis for the same parameters monitored in that program. The data will continue to be evaluated to determine if it is meeting the Termination Criteria. If the post-termination monitoring analytical results indicate that groundwater quality is no longer meeting the Termination Criteria set forth in Section III.A, the remedial system will be re-started within 30 days. After startup the Town can seek to demonstrate to the State, subject to its concurrence, that the Termination Criteria is in fact being met, or that the groundwater contamination discovered is attributable to a source other than the Landfill, per Section III.B.3.

C. Treatment System Discharges

Operation of the air stripper must be maintained to assure compliance with: 1) applicable air discharge requirements set forth in State Regulations and the State Air Guide No. 1 for the Control of Toxic Air Contaminants (Table 1); 2) applicable State Pollution Discharge Elimination System (SPDES) requirements, and 3) State Technical and Operational Guidance Series limitations for potable groundwater quality (Table 2). Prior to submission of the Final Design Plan required by Section I.J. herein, the Town shall develop a monitoring program, in consultation with the Department of Environmental Conservation permitting authorities to assure continued compliance of the air stripper with applicable air and water discharge criteria including permit or permit equivalent requirements. Upon approval by the State, such monitoring program shall be deemed incorporated as part of this RAP.

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D. Reporting

1. Quarterly Reports

a. Construction Period

Quarterly Reports will be prepared for each quarter of the construction period containing the following information:

- Description of work completed
- Delays and reasons
- Work projection for the next quarter
- Changes or modifications, including and dates of approval
- Problems and resolutions
- Revised schedule, if appropriate

b. Operating Period

Quarterly Reports will be prepared for each quarter of the operating period containing the following information and data:

- Pumpage records
- Treatment system air and water discharge data
- Treatment system performance records
- Data analysis (trends, position of plume, etc.)
- Modifications to system, including method and dates of approval
- Groundwater quality monitoring data
- Water level data

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- Potentiometric surface maps as revised
- Record of all system downtime

2. Annual Operating Report

An annual operating report will be prepared for each year of the operating period containing a summary and analysis of the information and data contained in the quarterly reports. The Town at its option may combine the 4th quarter report of each year and the annual report into one combined report.

E. Notification of System Downtime

In the event that the hydraulic containment/ treatment, or major operable unit thereof, is down or experiences failure for a period of 48 hours or more, the designated agent of New York State will be notified, by telephone, followed by a letter. During such down time or failure, the Town and its representatives will make every reasonable effort to obtain the necessary replacement equipment and re-start the system in an expeditious manner. If the system cannot be restarted within 48 hours after timely notification, the provisions of Section XXI of the Consent Decree shall apply, as appropriate.

III. TERMINATION

A. Termination Criteria

The criteria for termination of the hydraulic containment/treatment system are as follows:

The Town:

1) Demonstrates that groundwater affected by contamination from the Old Bethpage Landfill has been remediated so that all the wells required to be sampled in the Termination Monitoring Program meet the standards/guideline values given in Table 2 for the parameters analyzed.

- or -

2) (a) Demonstrates that groundwater affected by contamination from the Old Bethpage Landfill has been remediated to the extent feasible with the existing remedial system so that all the wells within the plume, required to be sampled in the Termination Monitoring Program, meet the zero slope condition as described in Attachment 3; and

(b) Demonstrates, subject to State concurrence, that any residual contamination is either 1) attributable to another source or 2) cannot be feasibly remediated with available Requisite Remedial Technology ("RRT") [defined in Section VI, paragraph 2 of the Consent Decree to mean known engineering, scientific and construction principles and practices, used or acceptable for use in the cleanup or containment of chemical contamination which are applicable to the materials and hydrogeological conditions found at the TOB Landfill and its environs, including new and innovative technologies which utilize a permanent solution to the maximum extent practicable] as set forth in Section XI of the Consent Decree; and

(c) Demonstrates that the level of contamination existing in the Termination Monitoring Wells located within the defined plume will not cause future exceedances of the standards/guidelines in the Termination Monitoring Wells located outside the defined plume, e.g. the observation wells installed as part of the remediation and Well Cluster No. 7.

B. Methodologies for Termination Criteria

1. Meeting Standards and Guidelines

The standards/guideline values presented in Table 2 are the criteria which must be achieved for each compound and for total VOC concentration in all monitoring wells designated for the Termination Monitoring Program for a period of two years (eight quarters) prior to termination.

2. Achieving the Zero Slope Condition

The zero slope condition refers to a demonstrated condition in which contaminant concentrations in all the Termination Monitoring Wells are lowered by the remediation, but do not achieve the standards and guidance values set forth in Table 2. Instead of continuing to be lowered, the concentrations reach a certain level and remain at that level during the two year Termination Monitoring period. This condition is demonstrated if a plot of concentration versus time for the two year Termination Monitoring period shows that the slope of the line is statistically indistinguishable from zero. The monitoring wells to be used in the evaluation of zero slope will be the Termination Monitoring wells agreed to as set forth in Section II.B.4(b). The contaminants to be used in evaluating the zero slope condition will be Termination Monitoring parameters agreed to as per Section II.B.4(b). The Zero Slope condition will be determined by the method set forth in Attachment 3.

3. Determination of Effects from Other Sources of Contamination

If one or more Termination Monitoring Wells does not meet the Termination Criteria set forth above, the Town may still seek termination of the remediation if all the remaining wells meet the criteria and the Town can demonstrate, subject to State concurrence, that the contamination in the non-complying wells is attributable to sources of contamination other than the TOB Landfill. The State will continue to make available to the Town all data it obtains with respect to other potential sources of contamination, including without limitation the Nassau County Firemen Training Center Facility and the Claremont Polychemical Site.

IV. GROUNDWATER SAMPLING PLAN

A. Sampling Preparation

Sampling will be conducted only by authorized representatives of the Town who are thoroughly knowledgeable of groundwater sampling procedures, and who have been thoroughly familiarized with the sampling protocol for this site. Health and safety procedures for sampling personnel are described in Section VI. The sampling personnel will coordinate with a New York State certified analytical laboratory to arrange for the appropriate containers. Prior to the start of the monitoring program, the laboratory will be provided with written instructions regarding the list of analytical parameters and reporting requirements; subsequent modifications, if any, in the laboratory procedures will be confirmed similarly, in writing. Such modifications will be subject to State concurrence. State representatives will be provided notice and access and richt to sampling split as set forth in the consent decree.

B. Sampling Protocol

The protocol for sampling will be submitted for approval by the State, prior to the start of the monitoring program.

C. Quality Control/Quality Assurance

A trip blank will accompany each day's samples during each sampling round. A trip blank is defined as a standard

40-ml VOA vial of organic-free water which accompanies the samples. The trip blank will not be opened at any time prior to analysis. The trip blank is then analyzed for VOCs. A field blank will be taken during each sampling round. A field blank is defined as two 40-ml VOA vials of organic-free water taken to the field during sampling. The water from the field blank will be poured through the sample/discharge fitting (after it has been cleaned according to protocol) and collected in a third vial. The field blank is then analyzed for VOCs.

During each sampling round, one duplicate sample will be taken and run for the appropriate parameters and as per the analytical methods for that sampling round.

There are certain substances which are frequently reported in laboratory analytical results and which are not present in the sample when collected. These contaminants are termed "artifacts" and are typically documented by their detection in laboratory blanks. USEPA has recognized a number of compounds as frequently occurring artifacts and has consequently relaxed acceptance criteria for QA/QC blanks for these compounds (see USEPA Contract Laboratory Program "Statement of Work for Organic Analysis", October 1986). The currently recognized artifact compounds are the following:

a. Methylene chloride

b. Acetone

c. Toluene

d. 2-Butanone

e. Listed Phthalate Esters

Results of method blank analyses are acceptable to EPA if they contain less than five (5) times the Contract Required Detection Limit (CRDL) for each compound (Method blank is described as "an analytical control consisting of all reagents, internal standards, and surrogate standards, that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background contamination"). For example, if the CRDL for methylene chloride is 5 ug/L, a concentration of up to 25 ug/L in a method blank analysis would still be acceptable.

Thus, in evaluating water-quality data for compliance with the terms of the RAP, the presence of certain compounds as artifacts will be considered. Contaminants which are inconsistent with the historical database will be investigated as possible artifacts. Demonstration of a compound as an artifact may be in one or more of the following ways:

1. By providing laboratory QA/QC data showing the presence of the compound in method blank sample(s), per the above discussion of CLP requirements.

2. By citing a government publication of analytical methodologies or criteria which provides for an allowable persistent artifact(s), beyond compounds (a) through (e) cited above, provided that the particular concentration in question is within the allowable range.

3. By resampling, provided the new sample indicates a nondetectable (ND) concentration or meets one of the above criteria.

Sampling records will be completed for each, and these records become part of the project file. Chain of custody forms will accompany each day's delivery of samples.

V. SAMPLE ANALYSIS PLAN

The analytical methods appropriate to each sampling program are specified in this document. The appropriate procedures are incorporated by reference. The laboratory will report the data in a form consistent with the previous studies and monitoring, i.e., constituent, concentration, and units.

VI. HEALTH AND SAFETY CONSIDERATIONS

The RAP presents the plan for collection and treatment of groundwater affected by contamination from the Old Bethpage Landfill and source control of landfill gas and leachate. As specific job descriptions are defined for construction, operation, and monitoring of the remedial system, job-specific health and safety requirements will be developed. The requirements will be kept in a central file onsite and copies provided to the State representative.

The health and safety requirements will be designed to comply with OSHA's General Industry Standards, as well as more newly-issued hazardous waste regulations (29 CFR 1910.120). If two standards cover the job, the more stringent standard will apply. With regard to the hazardous waste regulations, every reasonable attempt will be made to use engineering controls and/or work practices to minimize the possibility of exposure, as opposed to relying on personal protective equipment (consistent with OSHA policy). Further, air monitoring will be conducted to evaluate exposure hazards, and all personnel who may potentially be exposed will undergo yearly medical monitoring. The health and safety plan will be submitted to the State for approval as set forth in the consent decree and the Schedule in Sections J and K and prior to commencement of the remedial construction.

RAP ATTACHMENT 1

Landfill Cap Specifications and Testing Requirements

1. The clay cap shall be constructed in 6-8 inch thick lifts (after compaction), must meet the following specifications or must be mixed with an appropriate material to meet the following specifications:

   a. Permeability: 1×10^{-7} cm/sec or less

   b. Grain Size: P200 content of 50% by weight or greater

   c. Liquid Limit: 25% or greater

   d. Plasticity Index: 10% or greater

   e. Compaction: 90% Modified Proctor density or greater

   f. Moisture Content: varying between optimum and 2% of wet of optimum

2. To ensure attainment of the required permeability for the clay cap the following documentation testing shall be performed:

   a. Analysis of grain size distribution using the Unified Soil Classification System (ASTM D2487) and analysis of Atterberg Limits on at least one sample for every 500 cubic yards of clay placed.

   b. Development of reference compaction (dry density and moisture content) and permeability curves using at least three points per curve for each sample of material proposed to be used for the cap and for at least one sample for every 500 cubic yards of clay placed.

   c. Measurements of in-situ compaction using a nuclear densiometer (ASTM D2922) at the intersection points of a 100-foot grid pattern. The grid shall be offset for each lift of in-place material.

   d. Measurement of laboratory saturated hydraulic conductivity on a minimum of one undisturbed sample per acre per lift of clay placed. The procedure for obtaining the undisturbed sample and performing the test must be approved by the State.

Any portion of the constructed cap which fails to achieve an in-situ density required to provide a permeability of 1×10^{-7} cm/sec or less, as judged from the reference compaction curves or from the laboratory hydraulic conductivity tests shall be reconstructed until the requisite dry density and permeability are achieved and verified by the State.

3. A qualified soil technician or engineer shall be present during construction of the cap to provide visual inspection and direct sampling and testing. The results of the in-situ density and permeability tests shall be analyzed by a geotechnical professional and submitted to the State with the professional engineers' certification of construction.

RAP Attachment 2

OLD BETHPAGE LANDFILL
SUPPLEMENTAL GAS MONITORING PROGRAM

The supplemental landfill gas monitoring program for the Old Bethpage Landfill Remediation Program contains five components. These are 1) the collection of ambient air samples; 2) the collection of subsurface gas samples at a depth of 30"; 3) the collection of subsurface gas samples at depths of 10', 20', 30' and 40'; 4) the collection of thermal oxidizer emission samples (stack testing); and 5) the measurement of gas pressure to ascertain negative pressure created by the gas collection system. These data requirements supplement the existing methane gas monitoring program and will be reported in the annual reports produced under that program.

The location of the proposed sampling points are shown on Drawing No. 1, entitled "Old Bethpage Landfill Zero Percent Methane Gas Migration Contours, 1986 Annual Site Survey". A description of the various components of this program follows.

Ambient Air Samples

Ambient air samples (24 hr. samples) will be collected at three locations around the landfill as shown on Drawing No. 1. One location will be along Winding Road to the east and southeast of the landfill (near M-3 shown on Drawing No. 1). One location will be to the west of the landfill along Round Swamp Road (near M-33). A third location will be north of the landfill (between M-17 and M-22). Samples at these locations will be collected quarterly during the initial year of the program and, if approved by the State, on an annual basis thereafter. Samples will be analyzed for volatile organic compounds.

30" Deep Subsurface Gas Samples

Fourteen subsurface gas samples will be collected at a depth of 30" at the following locations surrounding the landfill as shown on Drawing No. 1: F-1, M-2, M-4, M-5, M-6, M-13, M-16, M-21, M-22, M-28, M-31, M-34, M-37 and M-39. Samples will be collected on a quarterly basis during the initial year of the program and, if approved by the State, on an annual basis thereafter. Samples will be analyzed for volatile organic compounds.

Subsurface Gas Samples at Various Depths

Subsurface gas samples will be collected at depths of 10', 20', 30', and 40' at location M-9 (to be repaired or replaced) shown on Drawing No. 1. Samples will be collected on a quarterly basis during the initial year of the program and, if approved by the State, on an annual basis thereafter. Samples will analyzed for volatile organic compounds.

Thermal Oxidizer Emissions

Thermal oxidizer emissions will be sampled (in the incinerator stack) on a quarterly basis during the initial year of the program. The emissions will be related to oxidizer incinerator temperatures during this initial year of sampling. Thereafter, the oxidizer temperatures will be monitored on a monthly basis to insure that temperatures needed to volatilize the organics are being maintained in the oxidizer. The emissions will continue to be sampled on an annual basis. Samples will be analyzed for volatile organic compounds.

Pressure Readings

Pressure readings will be taken at three locations around the perimeter of the gas collection system to ascertain whether a vacuum is created around the system. This data will assist in monitoring the effectiveness of the system and in determining whether the system needs adjustment or enhancement. One reading will be taken to the south of the landfill at either F-6 or F-9 (existing probes) shown on Drawing No. 1. A new probe will be installed and a reading taken to the northwest of landfill between LGV 16 and LGV 17. The third probe will be installed and a reading taken to the southeast of the landfill between TGV-1 and LGV-9. Pressure readings will be taken on a quarterly basis during the initial year of the program and, if approved by the State, on an annual basis thereafter.

RAP Attachment 3

For the purposes of determining the zero slope condition, the concentrations of the organic parameters will be totaled for each quarter to produce a concentration versus time plot for each well, for a total of eight such plots. It will be required that the zero slope condition exist in each of these Termination Monitoring wells.

The method to be used for determining whether zero slope has been achieved is as follows:

The data will be tested for normality and the selected statistical test will be determined by the following procedure:

1. Plot concentrations obtained over time on probability paper.

2. Evaluate for normality by an agreed upon objective method.

3. If data is not normally distributed, transformations such as lognormal may be employed in an attempt to obtain a normal distribution. Transformed data will be tested for normality.

4. If the data is normally distributed, the most powerful parametric test will be used.

5. If the data is not normally distributed, the most powerful non-parametric test will be performed on the data.

During the course of the remedial activities, either party may request, as provided in the consent decree, to alter the above procedure, as appropriate, to provide a more powerful test, as statistically defined.

APPENDIX II of ROD Attachment 2

NUMERICAL GROUNDWATER FLOW MODEL

The groundwater flow model used by Geraghty & Miller, Inc. for this study is the basic aquifer simulation program, modified for water-table conditions, as described by Prickett and Lonnquist, (1971). The model uses the finite-difference numerical method to obtain approximate solutions to the equations that define groundwater flow.

The flow model was constructed by utilizing hydrogeological data obtained from published sources augmented by field data obtained during the CBSWDC offsite drilling and monitoring programs. The input data include water-level elevations, hydraulic conductivity, elevation of the "bottom" of the water-table aquifer, transmissivity, storativity, recharge and model imposed boundary conditions.

Model Grid

The region included in the flow model encompasses an area which is 12,000 feet by 14,500 feet and is represented by a rectangular grid of 18 columns and 20 rows. The grid, which is variably spaced, was superimposed over a map of the aquifer. A fine grid spacing (500 foot grid intervals) was used within the leachate plume to provide detail. Coarser grid spacings of 2000 foot grid intervals were employed further away from the plume to complete the flow system and establish boundaries beyond the impacts from aquifer stresses (i.e., pumpage). The 500-foot spacing was considered appropriate given the maximum plume width of approximately 4,250 feet. The aquifer system properties were discretized by assigning specific values to each node which occur at the intersection of column and row grids.

Water-Level Data

A groundwater elevation map was obtained from Geragnty & Miller, Inc.'s August 1985 report. Site-specific water-level data from the report were obtained from the 23 off-site program monitoring wells, Phase 3 monitoring wells, and Nassau County observation wells on June 5, 1985. The water-level map indicated that the hydraulic gradient ranged from a low of 0.0013 ft/ft to a high of 0.0027 ft/ft with an overall average hydraulic gradient of approximately 10.56 feet per mile (0.002 ft/ft). The overall gradient was interpolated linerally to establish upgradient and downgradient model boundary conditions.

Hydraulic Conductivity

Hydraulic conductivity values were obtained from published reports and found to range from 400 to 1,100 gallons per day per square foot (gpd/sq ft). Sensitivity analyses were performed using the flow model and a value of 800 gpd/sq ft was found to produce hydrostatic heads that best represented field conditions. Values lower than 800 gpd/sq ft resulted in simulated heads that were too high when compared to the measured water levels of June 5, 1985. Similarly, higher hydraulic conductivity values produced simulated water-table elevations that were lower than the June 5, 1985 values.

Saturated Thickness

The groundwater system in the modeled area has a saturated thickness of approximately 700 feet. In essence, this aquifer is a large, thick sequence of sand with varying amounts of silt and clay layers that impede flow in places, but that do not constitute a continuous confining unit separating shallower water-table and deeper confined aquifers. Since leachate contamination is limited to the upper 250 to 300 feet of saturated materials, a saturated thickness of 300 feet was used in the model.

In order to control a 300 foot thick plume in an aquifer whose saturated thickness is 700 feet, the remedial wells would have to be partially penetrating. Additional analyses were performed to account for the effects of partial penetration (which would be the case under field conditions) on drawdown and the volume of water pumped to control the plume. Calculated drawdown values were applied to the flow system (as shown by the June 5, 1985 water-level elevation map) and results indicate that the plume boundaries are within the simulated pumping barrier.

It should be noted that the model's simulation presents optimistic results with respect to pumping rates because the model simulates the aquifer as if the bottom of the system is located 300 feet below the water-table surface. Hence, flow to the remedial wells in the model is horizontal. However, under field conditions of partially penetrating remedial wells, some water would move vertically up to the wells in addition to predominant horizontal movement. More water would have to be pumped to offset this vertical component of flow, however, the additional pumpage, if any, cannot be quantified in advance of a pumping test involving one remedial well.

Transmissivity, Storage Coefficient and Recharge

Aquifer transmissivity, T, is defined by the relationship T = Kb, where K is the hydraulic conductivity and b is the saturated thickness. Published values of transmissivity range from 51,000 to 270,000 gallons per day per foot (gpd/ft) and an initial transmissivity value of 240,000 gpd/ft was calculated by the model from the hydraulic conductivity and the initial saturated thickness. In this case, because wells are pumping and water levels are declining, the saturated thicknesses within the cones of influence decrease, resulting in reduced transmissivities. The model revised transmissivity values to account for this decrease in saturated thickness.

The storage coefficient is important only for transient simulations where it provides an indication of how quickly an aquifer will respond to a change in stress. The groundwater system was simulated under steady-state conditions, thus the storage coefficient is irrelevant. However, for the purposes of the numerical code, one must be entered. A published storage coefficient of 0.2 (dimensionless) was used.

Recharge to the water-table aquifer is supplied by precipitation. The average annual recharge rate is on the order of 21 inches (Isbister, 1966), which translates to a value of approximately one million gallons per day per square mile (1 mgd/sq mi) or about 0.0359 gpd/sq ft.

Calibration/Approximation of Field Conditions

Several simulations were run until the computed heads reached "steady-state", no longer changing with time. The resultant head distribution and hydraulic gradient from the model were found to approximate field conditions. The average simulated hydraulic gradient is about 0.0026 as compared to a field value of approximately 0.002. The general direction of the groundwater flow is toward the south-southeast. Additionally, the observed water-level elevations in the 23 off-site wells, Phase 3 and Nassau County observation wells (from June 5, 1985) were compared to the simulated heads, and differences between the two were less than one-half foot while some values were reproduced exactly.

Simulations of Remedial Pumping

Prior to simulating remedial pumpage options, preliminary values on the number of wells and potential pumpage rates were calculated analytically. Calculations of draw-down from partially penetrating wells were analyzed, and the areas of groundwater contribution to wells pumping in an aquifer with uniform flow were investigated (Todd, 1980, pp. 121-123). Pumpage rates per well from 500,000 to 1,625,000 gallons per day (gpd) and transmissivities ranging from 200,000 to 350,000 gpd/ft were used in these analytical techniques. When draw-down exceeded one-half foot at the edge of the plume and the areas of groundwater contribution to the pumping wells overlapped, the number, locations and pumpage rates were considered to be potentially successful in controlling the leachate plume. These combinations were then simulated utilizing the flow (numerical) model, as it accounts for changes in transmissivity and hydraulic gradient, which better approximates field conditions than the analytical techniques.

Results

Results indicate that five wells placed along the leading edge of the landfill leachate plume, would have to be pumped at a total approximate rate of five million gallons per day (MGD) to capture the entire plume. This is an optimistic estimate because of assumptions and restrictions in the construction of the model, discussed in Section 2.2.5. Under field conditions, the pumpage rate is likely to exceed five MGD.

A comparison between the numerically and the analytically derived results was made to demonstrate the reliability of the results obtained from the numerical analysis. The analytical method employs equations that define the geometry of the cone of influence from a pumping well in a uniform flow field as presented in Todd (1980). Calculations were made using the stagnation point formula and the expression for the boundary of the region producing inflow to a pumping well in a uniform field. The limiting flow lines for a well pumping at a rate of 500,000 gpd and 1,000,000 gpd were calculated. Superimposition of the resulting zones of influence showed that six and four wells, respectively, are necessary to capture the entire landfill leachate plume. These numbers of wells and pumping rates result in a total pumpage of three and four MGD, which is in reasonably good agreement with the numerical model results of approximately five MGD. Unlike the numerical model, the analytical (Todd) calculations do not account for changes that occur in the groundwater system as a result of pumping (e.g., interference effects, changes in saturated thickness and gradient, etc.). Thus the numerical approach better represents field conditions and the results of this numerical analysis more accurately approximate the pumping stress and aquifer response.

The concentrations of volatile organic compounds (June, 1985 sampling round) were summed for each well cluster, and plotted on a site map; from these data, the approximate extent of the plume defined by 50* ug/L of total volatile organic compounds (TVOC) was determined. The flow model was then used to simulate different combinations of wells and total pumpage rates to determine the configuration and rate that best captured this plume.

Pumpage of 1.5 MGD appears to control the organics plume, while a pumpage rate of 2 MGD apparently exceeds the rate necessary to intercept the organics contaminated groundwater.

* The precision of the model construction did not allow for distinction between 50 ug/L and 0 in this analysis. Therefore, the edge of the plume to be captured is defined as being in that range.

Based on the model results, it appears that the minimum pumpage required to intercept the organics plume as defined is approximately 1.5 MGD. The 1.5 MGD is divided among 5 wells, each pumping 300,000 gpd. Lower pumpage rates and/or fewer wells were judged ineffective to capture the plume. The location of the pumping wells are shown on Figure 2-1.

The flow model simulated only a portion of the total saturated thickness of the flow system. Thus, the 1.5 MGD and 1.0 MGD pumping schemes were also tested with analytical calculations that take into account the partial penetration of the pumping wells. Finally, captur zone calculations were also done to test the scheme. These last two analyses indicate that the interpretation of the flow model simulations is correct, thus results of three approaches corroborate one another.

AIR STRIPPING

Air stripping is a simple, reliable mass transfer process by which volatile organic contaminants are removed from aqueous solution and transferred to the atmosphere. By Henry's Law, those volatile components having a high partial pressure have an affinity for the air phase over the water phase. As a mass transfer phemonena, air stripping is enhanced when the greatest degree of contact between the air and water stream is provided; however, Henry's Law and the laws of solubility indicate that complete removal of organic contaminants by air stripping is impossible.

To promote good contact of air and water, most air stripping arrangements provide for countercurrent operation in packed towers. Contaminated water is directed to the top of the tower where it trickles down over the packing providing a large, constantly wet and renewed area for mass transfer; at the same time air is blown through the packing from the tower bottom. The exhausted air stream contains much of the initial organic contamination.

It is obvious that for a given water flow rate, a point can be reached where increasing the air volume to the packed tower will eventually inhibit and then prevent the downward water flow. This condition is known as "flooding" and typically air strippers are designed to operate at an air to water ratio representing the air flow at 60% of flooding. Different packing arrangements will influence the point at which flooding occurs and therefore, the volume of air introduced will also change. Optimun stripping will occur when the largest wetted surface area is exposed to the largest air flow.

The primary advantages of employing air stripping as a treatment option are the relative simplicity of the equipment and operation, and subsequent lower cost over other treatment methods. Air stripping also preferentially removes those lower weight molecular weight organic compounds least ammerable to treatment by activated carbon. The major disadvantages concern the higher degree of maintenance often required to prevent scale buildup on the tower internals and packing, which ultimately leads to channeling of the water flow through the tower which inhibits treatment. Chemical pretreatment of the water phase is often required to remove potential scale products and suspended solids, and also to reduce the solubility of some contaminants to improve their transfer to the air phase. Although preliminary air stripping designs can be predicted on prior experience, the optimum air to water ratios, packing arrangements and other pretreatment requirements are better established by pilot scale treatability studies.

ACTIVATED CARBON ADSORPTION

As previously indicated, simple air stripping, while capable of removing gross levels of volatile organics effectively, cannot achieve an essentially zero level of contamination in the effluent. Treatment by highly porous activated carbon is the most thoroughly understood and reliable process currently employed to remove trace organics. It is effective over a broad range of chemical species and treatment levels below 10 ppb have been reported. The less volatile organic compounds not removed by air stripping are often very amenable to this treatment process.

Porous carbon removes contaminants by adsorption, a process wherein matter is extracted from solution and concentrated at the carbon/water interface, and therefore is known as a surface phenomena. Depending on the nature of the chemical removed, surface deposition may be due to low solubility, the weak Van der Waals forces, and electrical or chemical bonding. Most probably, a combination of these mechanisms are at work.

As a surface attraction phenomena, removal efficiency is enhanced and contact time subsequently reduced when the individual carbon particles are "activated". Activation involves the enlargement of the existing pores into a macroporous structure, which greatly increases the surface area of carbon available for adsorption. The larger the surface area, the generally more effective the carbon will work to remove a contaminant. Although specialty carbons are available with surface areas as large as 2500 square meters/gram, treatment designs employing surface areas of 1000 square meters/gram are more typical. This structure results in a material that is highly selective for organic compounds and in particular, very well suited for the removal of mixed organics from aqueous solution.

The mechanisms of adsorption take place by initial attachment of an organic molecule to the carbon surface, diffusion through the porous structure and finally, accumulation on the deep interior capillary spaces of the activated carbon particles. In addition to the nature of the carbon substrate, the factors influencing the adsorption process include the nature of the chemical adsorbed, such as its molecular shape, size and polarity, the nature and pH of the transport medium, and finally the design and configuration of the equipment hardware.

The ability of activated carbon to adsorb organics without rerelease or desorption remains nearly constant during the useful life of the carbon. The end of the useful life of activated carbon for treatment is defined as "breakthrough", wherein a marked increase in effluent organics concentration is noted. Breakthrough typically occurs when up to one pound of organics has been adsorbed per cubic foot of carbon. In large systems the spent carbon is regenerated in situ with steam, producing a low volume aqueous solution of organics for disposal. In smaller systems, such as described for this report, the spent carbon is exchanged with an outside vendor for fresh carbon. The vendor then regenerates the carbon at his facilities for eventual resale and reuse.

The prime advantage of activated carbon treatment is its unique ability to produce an effluent containing almost no organic contamination over a wide range of organic species and influent concentrations. It is not particularly sensitive to changes in concentration or flow rate. Other advantages include good selectivity, no requirement for chemical additions, ease of waste products handling, overall ease of operation and small space requirements; however, these advantages come at a price. Activated carbon treatment is often the most expensive treatment option (per pound of contaminant removed), and therefore, is usally reserved as a final "polishing" treatment after gross contaminant removal.

Aside from cost, other disadvantages include the need for specialized tankage and coatings to minimize corrosion, and prefiltering, to minimize plugging of the carbon pores by suspended solids, which will impair treatment efficiency and reduce the useful life of the carbon bed.

Although it is considered a well developed technology, the phenomenon of adsorption is complex and not necessarily predictable. To accurately predict system performance, carbon life and the operating economics, field pilot plant studies are necessary.

ROD ATTACHMENT 3

PUBLIC RESPONSIVENESS SUMMARY
OLD BETHPAGE LANDFILL

The State of New York held two public comment periods for interested parties to comment on plans and studies prepared for the remediation at the Old Bethpage Landfill, Old Bethpage. The first comment period, held from May 1, 1984 to June 28, 1984, concerned the proposed Interim Consent Decree. The second comment period, regarding the Remedial Action Feasibility Study, began on July 16, 1987 and ended after a substantial extension on September 15, 1987. During this second period, public meetings were held on July 23 at the Plainview-Old Bethpage High School and on September 10 at JFK Kennedy High School in Plainview.

Notification of the meetings were included in the Long Island edition of Newsday and other local weeklies (Exhibit A) and individual notices were sent to representatives of all interested groups. Transcripts of these last two meetings were prepared and available for public review. In addition, all documents used in developing the remediation are available for public review at the Plainview Public Library, 999 Old Country Road, Plainview, New York.

I. Overview

The Interim Consent Decree set forth the plan and schedule for the Remedial Investigation (RI) and Feasibity Study (FS) as well as requirements for interim remedial measures. Once the RI was completed, the Town of Oyster Bay and its consultants prepared the FS which was immediately distributed in July 1987 to those groups and individuals that had previously expressed interest. Subsequently, copies were made available to the public as requested and were also handed out at the first public meeting. The FS described the alternative remedial approaches considered and specified the State's subsequent recommendation of the most effective alternative.

Fifteen classes of response actions were identified by the US EPA for consideration in remediating this site. Within the study, each method was reviewed for health, environmental, technological and economic factors. In an initial screening several response actions were removed fro consideration because they were deemed inapplicable for one or more of the following reasons:

- The response action offered little or no benefit,
- The response action required technologies which were not proven;
- The response action required unprecedented technologies which would be technically and/or economically infeasible; or
- The response action required technologies which have significant inherent environmental or health risks.

Response actions deemed appropriate for further consideration i.e. capping, pump and treat, monitoring, etc. were integrated into two remedial concepts:
1) capture of the contaminated groundwater through pumping and subsequent treatment, and 2) the provision of an alternative water supply. These two basic remedial concepts were then developed into seven alternatives (six of which were variations of the pump and treat method) for detailed analysis. The seven alternatives are summarized in detail below. Their numbers correspond to their listing in the draft FS.

Alternative No. 1 - Alternative water supply

Alternative No. 2 - Removal of groundwater by pumping; pipe to the landfill for use in operation of the proposed Resource Recovery Facility (RRF);* and discharge of waste water from the RRF into sanitary sewer system on Winding Road.

Alternative No. 3 - Removal of groundwater by pumping; pipe to the landfill for treatment to remove TVOC's; and discharge of treated water into sanitary sewer on Winding Road.

Alternative No. 4 - Removal of groundwater by pumping; pipe to the landfill for partial use in the proposed RPF and for treatment and discharge of the remaining water to sanitary sewer system on Winding Road. * (Combines Alternatives No. 2 and No. 3.)

Alternative No. 5 - Removal of groundwater by pumping; treatment to remove TVOC's, and discharge to a leaching field within Bethpage State Park boundaries (in the middle of a public golf course).

Alternative No. 6 - Removal of groundwater by pumping; treatment to remove TVOC's and disposal in a storm sewer on Plainview Road

Alternative No. 7 - (Recommended Remedial Action) Removal of groundwater by pumping; pipe to the landfill for treatment to remove TVOC's, and discharge to a recharge basin-leaching field system upgradient of the landfill.

* A Resource Recovery Facility (RRF) is being proposed by the Town of Oyster Bay. It will be subject to a lengthy State permitting process. New York State has informed the Town that the State is not willing to accept a remedial alternative that is contingent upon approval of the RRF.

After analysis of these site alternatives, and careful consideration of public comments, Alternative No. 7 was selected as the appropriate Remedial Action for this site.

II. History of Community Involvement & Concerns

Community response to the planning stages of the landfill remediation has been moderate. Certain individuals and groups in the community continued to inquire about and monitor the RI/FS process to insure the State's awareness of community concerns and interests. Some participants in the comment process have expressed an underlying skepticism of the Town of Oyster Bay's intentions. Past and actions by the Town relating to the landfill have resulted in a confrontational relationship between the Town and certain groups in the community.

Residents Against Garbage Expansion (R.A.G.E.), the citizen group most active during the public comment periods, was originally formed to contest the Town's efforts to obtain State approval for expansion of the Old Bethpage Landfill. In addition, other local groups and officials have participated in the process, including Assemblyman Lewis J. Yevoli, the Commissioners of the Plainview Water District, the Plainview/Old Bethpage School Board, and members of the Old Bethpage Grade School P.T.A.

Most of the comments the State has received fall into two categories: 1) those of a precautionary nature, requesting the State to monitor closely certain aspects of the investigation and remedial plan and 2) those of an accusatory nature, questioning the Town of Oyster Bay's actions and motivations in recommending Remedial Alternative No. 7. The State is satisfied that all primary concerns of the community were given adequate attention prior to the implementation of the RI (per the Interim Consent Decree) and the ultimate selection of the appropriate Remedial Action. Following is a summary of the major comments, both written (Exhibit B) and oral (Exhibit C), received during the public comment period on the FS and recommended alternative and the State's responses to these comments. All comments and responses which occurred prior to the distribution of the FS are located in the administrative record.

EXHIBIT A

NOTIFICATIONS OF PUBLIC MEETINGS TO DISCUSS THE REMEDIAL ACTION FEASIBILITY STUDY FOR THE OLD BETHPAGE LANDFILL, BETHPAGE, NY

Two meetings were held to discuss the Remedial Action Feasibility Study (RAFS) prepared for the Old Bethpage Landfill. The meetings took place on July 23, 1987 and September 10, 1987.

As public notification for the July 23rd meeting, a legal notice appeared in the Nassau-Suffolk edition of Newsday (Attachment 1). A press release was also prepared and distributed with the RAFS (Attachment 2). In addition, a copy of the RAFS and an explanatory letter were sent to approximately 25 individual citizens and leaders of citizen groups who had previously expressed concern regarding the site.

Prior to the September 10th meeting, a notice conveying the details of the meeting was distributed to a number of community weeklies as well as Newsday's Long Island Agenda (Attachment 3). Also, another notification letter was sent to approximately 30 concerned citizens and groups.

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NOTICE OF PUBLIC MEETING TO DISCUSS CLEANUP PROPOSALS FOR OLD BETHPAGE LANDFILL, OYSTER BAY

Public notice is hereby given that at 7:30 p.m. on Thursday, July 23, 1987, the New York State Department of Law and Department of Environmental Conservation will hold a public meeting in the auditorium of Plainview-Old Bethpage Sernior High School, Southern Parkway and Central Park Road, Plainview. The purpose of the meting is to explain and answer questions on a report, officially a "remedial action feasibility study" pursuant to 42 U.S.C. 9601 et seq., which was released on July 16, 1987 by Attorney General Robert Abrams and Environmental Commissioner Thomas C. Jorling.

The aforementioned report, prepared by private consulting engineers and groundwater consultants for the Town of Oyster Bay, sets forth an analysis of alternative proposals and a recommendation for cleanup of polluted groundwater ("plume") at the Old Bethpage Landfill in Oyster Bay."

The study first evaluated the feasibility of the following general remedial alternatives: 1) no action/alternative water supply; 2) excavation of the landfill (removal of the solid waste); 3) containment of the groundwater plume by a subsurface barrier wall; 4) in place chemical or biological treatment of groundwater; 5) groundwater extraction (via well pumping) and treatment.

The initial screening resulted in the rejection of non-feasible and non-applicable remediations and the choice of seven specific remedial alternatives for more thorough analysis to evaluate their relative applicability to the Old Bethpage Landfill. The factors used in analyzing these alternatives were technical feasibility, environmental impact, public health effects and institutional constraints.

The first alternative studied was the no action/alternative water supply proposal which would monitor the groundwater and public water and provide alternative water supplies in the future if necessary. Alternative Nos. 2 through 7 analyzed variations of the groundwater extraction and treatment methods and proposed differing locations for disposal. Alternatives 2 through 7 are designed to actively remediate the landfill plume.

The consultants recommend Plan Alternative No. 7 which includes:

1) capping the landfill with a clay cover to significantly reduce leaching of chemical compounds from the landfill;
2) installation of 5 barrier wells to hydraulically control the migration of contaminated groundwater and pump it to a treatment facility;
3) treatment of the collected groundwater in accordance with all applicable laws and regulations; and
4) recharge of the treated water to the aquifer in accordance with all applicable laws and regulations.

Copies of the Remedial Action Feasibility Study are available at the Attorney General's Environmental Protection Bureau, 120 Broadway, N.Y., N.Y. 10271 and at Oyster Bay Town Hall on Audrey Avenue and the Plainview Public Library, 999 Old Country Road in Plainview. The State will consider all written and oral comments provided to the Environmental Protection Bureau by August 14, 1987.

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Attachment 1

FOR IMMEDIATE RELEASE: THURSDAY, JULY 16, 1987

ABRAMS AND JORLING INVITE PUBLIC COMMENT ON OYSTER BAY CLEANUP PROPOSALS

Attorney General Robert Abrams and Environmental Commissioner Thomas C. Jorling today (Thursday) released a consultant's recommendation for cleanup of polluted groundwater at the Old Bethpage Landfill in Oyster Bay.

In a report and recommendation prepared for the Town of Oyster Bay, private consulting engineers and groundwater consultants considered the possible ways of dealing with the underground "plume" of contaminated water that is spreading from the landfill towards a public drinking water supply. The report is based on information collected from 23 monitoring wells drilled around the 65-acre site.

The consultants recommended a $7-million plan to capture the polluted groundwater with five "barrier" wells to be installed in Bethpage State Park. The water would be pumped to the surface, treated to remove the pollutants, and discharged back into the ground.

Preparation and release of the report, officially a "remedial action feasibility study," was part of a 1984 interim consent decree in a lawsuit brought by the Attorney General against the Town of Oyster Bay and several corporations which allegedly sent hazardous substances to the landfill. The town and the corporate defendants, including Occidental Chemical Corporation, Cerro Conduit Company, Inc., and Grumman Corporation, have in turn sued more than 160 other parties.

Filed in Federal Court in Brooklyn on December 9, 1983, the suit charges that the town and the corporations created, maintained and failed to correct the environmental problems at the landfill. The case was referred to the Attorney General by the Department of Environmental Conservation (DEC), which ordered the landfill to close in 1986.

The interim consent agreement also required further capping of

Attachment 2

The Attorney General stated:

"The proposed remediation offers an opportunity not only [illegible] sto pollution, but also to undo much of the damage that has been done since 1958. Long Island's groundwater is a precious and scarce resource, and every effort must be made to insure its purity and safety.

Commissioner Jorling stated:

"Adoption of the proposed remedial program will assure that the landfill will be properly closed and capped in accordance with DEC's regulations as soon as practicable. Moreover, the plan will assure that the site is fully remediated so that environmental threats posed by prior disposal of toxic wastes will be abated."

The Attorney General and the Commissioner said public comment o the proposals will be received during the next 30 days. Interested group and individuals who desire copies of the study, or to comment on it, shou write the Attorneys General's Environmental Protection Bureau, 120 Broadway, New York, N.Y. 10271. Copies are also available to the p[illegible]ic a the Oyster Bay Town Hall on Audrey Avenue and the Plainview Public Librar 999 Old County Road in Plainview.

In addition, they said, a public discussion has been scheduled for July 23 at 7:30 p.m. in the auditorium of Plainview-Old Bethpage Seni High School, Southern Parkway and Central Park Road, Plainview. Representatives of the Attorney General's office, DEC and the Town of Oyster Bay will be present.

Following the 30-day review, DEC and the Attorney General will adopt a remediation plan.

The matter was handled for the Attorney General by Assistant Attorneys General Robert Osar, Gail Suchman and Nancy Stearns, and Laine Vignona of the technical staff, under the supervision of James Sevinsky, Chief of the Environmental Bureau. It was handled for the for the DEC by Joseph Slack, John Iannotti and Brian Davidson of the Division of Eastern Remediation.

Hicksville, NY
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11040
516-GE 7-1047

Meeting For Old Bethpage Landfill

The New York State Department of Law and Department of Environmental Conservation will hold a second meeting to hear public comment on cleanup proposals for groundwater contamination at the Old Bethpage Landfill, Oyster Bay, which were presented in the "Remedial Action Feasibility Study" distributed in mid July. The meeting will be held at 7:30 p.m. on Thursday, September 10 at John F. Kennedy High School.

Copies of the study are available at the Plainview Public Library and at Oyster Bay Town Hall. Written comments on the proposals will be accepted before September 15 at the Attorney General's Environmental Protection Bureau, 120 Broadway, New York, New York, 10271.

Glen Cove
Record–Pilot
Glen Cove N.Y.
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Cleanup For Bethpage Landfill

The New York State Department of Law and Department of Environmental Conservation will hold a second meeting to hear public comments on cleanup proposals for groundwater contamination at the Old Bethpage Landfill, Oyster Bay, which were presented in the "Remedial Action Feasibility Study" distributed in mid July. The meeting will be held at 7:30 p.m. on Thursday, September 10 at John F. Kennedy High School.

Copies of the Study are available at the Plainview Public Library and at Oyster Bay Town Hall. Written comments on the proposals will be accepted before September 15 at the Attorney General's Environmental Protection Bureau, 120 Broadway, New York, New York, 10271.

Oyster Bay
Enterprise - Pilot
Oyster Bay, NY
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Copies of the study are available at the Plainview Public Library and at Oyster Bay Town Hall. Written comments on the proposals will be accepted before September 15 at the Attorney General's Environmental Protection Bureau, 120 Broadway, New York, New York, 10271.

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Farmingdale, N. Y

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Cleanup Hearing

The New York State Department of Law and Department of Environmental Conservation will hold a second meeting to hear public comment on cleanup proposals for groundwater contamination at the Old Bethpage Landfill, Oyster Bay, which were presented in the "Remedial Action Feasibility Study" distributed in mid-July. The meeting will be held at 7:30 p.m. on Thursday, September 10 at John F. Kennedy High School.

Copies of the Study are available at the Plainview Public Library and at Oyster Bay Town Hall. Written comments on the proposals will be accepted before September 15 at the Attorney General's Environmental Protection Bureau, 120 Broadway, New York, New York, 10271.

Oyster Bay, N.Y.

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Second Landfill Clean-UP Meeting Set for Sept. 10

The New York State Department of Law and Department of Environmental Conservation will hold a second meeting to hear public comment on cleanup proposals for groundwater contamination at the Old Bethpage Landfill, Oyster Bay, which were presented in the "Remedial Action Feasibility Study" distributed in mid-July. The meeting will be held at 7:30 PM, Thursday, Sept. 10 at John F Kennedy High School, Manetto Hill Road in Plainview.

Copies of the Study are available at the Plainview Public Library and at Oyster Bay Town Hall. Written comments on the proposals will be accepted before Sept. 15 at the Attarney General's Environmental Protection Bureau, 120 Broadway, New York, New York, 10271.

Jericho Tribune
Jericho, N.Y.

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Meeting For Old Bethpage Landfill

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Copies of the study are available at the Plainview Public Library and at Oyster Bay Town Hall. Written comments on the proposals will be accepted before September 15 at the Attorney General's Environmental Protection Bureau, 120 Broadway, New York, New York, 10271.

Midisland-Plainview Herald
OLD BETHPAGE ED.
Hicksville, NY

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Meeting For Old Bethpage Landfill

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Hicksville, NY

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Syosset, NY

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Meeting For Old Bethpage Landfill

Syosset Tribune
Syosset, NY

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Meeting For Old Bethpage Landfill

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Copies of the study are available at the Plainview Public Library and at Oyster Bay Town Hall. Written comments on the proposals will be accepted before September 15 at the Attorney General's Environmental Protection Bureau, 120 Broadway, New York, New York, 10271.

EXHIBIT B

PLAINVIEW-OLD BETHPAGE CENTRAL SCHOOL DISTRICT
Plainview, New York 11803

September 14, 1987

Mr. Robert L. Osar
Assistant Attorney General
State of New York
Department of Law
120 Broadway
New York, New York 10271

Re: Proposal for Cleanup of Polluted Ground Water at Old Bethpage Landfill

Dear Mr. Osar:

On Thursday, September 10 the President and Vice-President of the Plainview-Old Bethpage Board of Education, school attorney and Assistant Superintendent for Business had the opportunity to attend the public meeting at J.F.Kennedy High School for the purpose of eliciting public comment on the report entitled "Remedial Action Feasibility Study."

This report sets forth proposals for the cleanup of polluted ground water at the Old Bethpage landfill in the Town of Oyster Bay. The town's consultants have recommended a $7.0 million plan to capture the polluted groundwater with five "barrier" wells to be installed in Bethpage State Park. The water would be pumped to the surface, treated to remove pollutants, and discharged back into the ground.

As you know, much concern was expressed at the meeting from many quarters of a possible tie-in with a proposed resource recovery facility. Your assurances that any such proposal was separate and apart from the ground water cleanup not withstanding, the community continued to express its mistrust of the motives of the Town of Oyster Bay officials. Furthermore, officials of the Plainview Water District expressed their preference for Alternative #5, which would have deposited treated water further away in Bethpage State Park. They drew a comparison between their concerns for strict compliance with clean water standards, and past difficulties in obtaining compliance with orders to close the landfill and the incinerator, both of which were operating illegally.

You pointed out the difference between the Town's prior "operating" problems and the pure enforcement problem, indicating that the town would have no motive for failing to comply in the event the water treatment plant was not operating properly. It is this point which the Board of Education wishes to focus upon, because we feel the potential exists for just such a motive.

Let us assume that Alternative #7 remains the first choice, is approved and implemented. Let us further assume that the town's proposal for a resource recovery facility, though separate and apart from this proposal, is also approved and implemented. It is estimated that the resource recovery facility will use approximately one million gallons of water a day supplied by the treatment plant, which was separately proposed and implemented. Should this treatment plant fail to meet the standards required, we now have an operational problem as well as a pure enforcement problem, because the separate resource recovery facility will require its daily one million gallons.

We are very concerned that this is a more accurate parallel to prior town activities than you realize and since the result will be the deposition of polluted water near Plainview Water District wells, the consequences will be quite severe.

Very truly yours

AG:nl

Anna Goidell, President
Board of Education

cc: Ms. E. Gail Suchman

STATE OF NEW YORK
DEPARTMENT OF LAW
120 BROADWAY
NEW YORK, NY 10271
(212) 341-2461

ROBERT ABRAMS
Attorney General

JAMES A. SEVINSKY
Assistant Attorney General in Charge
Environmental Protection Bureau

October 27, 1987

Anna Goidell
President
Board of Education Plainview-Old Bethpage
  School District
Plainview, New York 11803

Re: Letter of September 14, 1987
Commenting on Old Bethpage
Landfill Remedial Action
Feasibility Study

Dear Mrs. Goidell and
Members of the Board of Education:

Thank you for your attendance at the public meeting on September 10, 1987, and your letter of September 14, 1987, providing specific comments on the Old Bethpage Landfill Remedial Action Feasibility Study and the proposed cleanup plan, Alternative No. 7. We have set forth below the comments from your letter and the response of the State to each one.

Comment 1: Page 1, paragraph 3.

Your letter expresses your concern and the concern of the community that proposed Alternative No. 7 will be used as supporting evidence by the Town of Oyster Bay in its attempt to locate a Resource Recovery Facility ("RRF") at the Old Bethpage Landfill.

State Response to Comment 1

Alternative No. 7 has been proposed by the State because it is the best environmental solution to the groundwater problem present at the Old Bethpage Landfill. Alternative No. 7 differs from the other alternatives mainly in the point of discharge chosen, which is hydraulically upgradient of the proposed recovery wells. The discharge water, although meeting all allowable federal and state discharge requirements, may contain low levels of

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contaminants. Only Alternative No. 7 provides a discharge location which will result in the recycling of this potentially contaminated discharge water back through the recovery system. This water will be recaptured and retreated and, therefore, will not escape into a non-contained environment. Furthermore, reinjection of the water into the system will speed the cleanup of the plume by "pushing" it more quickly toward the recovery wells.

In addition to the recognition of the environmental benefit resulting from implementation of Alternative No. 7, Alternative Nos. 3, 4 and 6 were deemed unacceptable because those alternatives would take approximately one and one-half million gallons of water per day from this portion of the aquifer, without replacement, contrary to the Long Island groundwater conservation policies set forth in 6 NYCRR Part 602. Alternative Nos. 2 and 4 were also rejected because, as stated in the public meetings and the Remedial Action Feasibility Study (see pages 3-1, 3-7 and 4-1), the State rejected any remediation which relied on the existence of a resource recovery facility for its operation. Alternative No. 7 does not rely on a resource recovery facility for its operation nor does it result in a contravention of the water conservation regulations.

Since the reasoning described above resulted in the rejection of Alternatives Nos. 2, 3, 4 and 6, the only other active remedial alternative was Alternative No. 5. That alternative was rejected for the reasons set forth in the State's response to Comment 2, herein. Therefore, the best remedial alternative, chosen on its own merit, is Alternative No. 7.

While it is true that the implementation of Alternative No. 7 will allow the Town to argue in its RRF permit application that a source of water will be available at the landfill, that argument is hardly dispositive of the multitude of legal, environmental and technical issues that will need to be decided before the Department of Environmental Conservation (DEC) can grant a permit for construction of the RRF. In point of fact, all the "pump and treat" remedial alternatives would provide a source of water for the RRF. The small expense of running a pipe from any discharge site to the RRF would allow the Town to argue that a source of water was available from any one of the proposed remedial alternatives.

The granting of a permit for the RRF is a totally separate and distinct legal process from the process which resulted in the selection of Alternative No. 7. The consideration of the RRF requires a complicated DEC administrative procedure, subject to public hearing and comment, which will decide whether the RRF can be permitted. That decision, just as the decision to select Alternative No. 7, will be made on the merits of the RRF itself, not on the fact that there happens to be process water available at the site. The RRF will need to pass strict technical and legal requirements for discharge, monitoring, performance, etc. Even if the RRF passes all those permit requirements, in order to be connected with Alternative No. 7, there would have to be technical confirmation that it would meet all the very stringent treatment and discharge requirements of the remedial action consent decree.

In sum, there is absolutely no significant legal or technical advantage which accrues to the Town in its application for the RRF by the selection of Alternative No. 7 over the other remedial alternatives.

Comment 2: Page 1, paragraph 3.

The officials of the Plainview Water District expressed their preference for Alternative #5.

State Response to Comment 2

As explained in detail in the response to the comments submitted by the Plainview Water District's consultant (copy attached hereto), the State strongly disagrees with the Commissioners' preference for Alternative No. 5 over Alternative No. 7. Alternative No. 5 studied the feasibility of locating a discharge basin closer to the recovery wells so that the cost of piping the groundwater to the landfill could be avoided. Areas within approximately 2500-3000 feet of the recovery wells were eliminated because it was determined that the recharge of one and one-half million gallons of water a day within that distance would interfere with the effectiveness of the hydraulic barrier to be created by these pumping wells. Areas immediately to the east and west of the landfill plume were also eliminated as possible discharge locations because those areas are potentially impacted by other sources of contamination.

The only potential area left for recharge under Alternative No. 5 was the southernmost portion of Bethpage State Park, i.e., the middle of a public golf course. Construction of a five acre treatment and recharge system in the middle of a public golf course would create a host of institutional problems. In addition, the recharge of treated groundwater in that area would be outside and downgradient of the hydraulic containment system, and approximately 1000 feet upgradient of the nearest Village of Farmingdale public drinking well. This is of concern because the treated groundwater may contain low levels of contamination. In addition, there is always a possibilit that the treatment system could temporarily malfunction.

In contrast, the Alternative No.7 discharge location ensures that the treated groundwater is recycled through the system for additional treatment, at no risk to the upgradient Plainview wells (see Response to Comment 5). The environmental benefits of Alternative No. 7 weighed against the problems associated with Alternative No. 5 justify its selection as the appropriate remedy for the site.

Comment 3: Page 1, paragraph 3.

The Plainview Water District Commissioners expressed concern that even though strict discharge criteria would be applied to the cleanup, the State has experienced a great deal of difficulty in the past in obtaining compliance by the Town with orders to close the landfill and the incinerator, both of which were operating "illegally."

State Response to Comment 3

This is an enforcement action to implement a cleanup of contaminated groundwater, not one to enforce permit conditions at an operating facility. The consent decree resolving this enforcement action will be monitored by the State and the Court. The decree will provide that the State will have the right to shut down the cleanup operation, if it is not meeting the requirements of the consent decree. The consent decree will require the Town to implement all necessary modifications required to bring the remedial program into compliance with all treatment and discharge criteria prior to re-start. Since there is no incentive for the Town to operate the remedial program unless it is in compliance with State requirements and any non-compliance will be immediately stopped by the State, there is no reason to believe that consistent or repeated non-compliance will occur.

Comment 4: Page 2, paragraphs 1 and 2.

Once the Resource Recovery Facility becomes part of the remedial program, the possibility of non-compliance becomes a concern because the Town will have incentive to keep the Resource Recovery Facility (like the old incinerator) operating, even if it is not in compliance.

State Response to Comment 4

If the RRF is permitted and if it is allowed to use water from the remedial program, it will then be required to meet both its permit conditions and the requirements of the remedial action consent decree. One of the conditions that the State will insist upon, if the recovery water is used in the RRF, is that the RRF will be shut down immediately if it fails to meet the air and water discharge requirements of the consent decree. Therefore, the concern over consistent or repeated non-compliance is unfounded because the existence of the consent decree, providing immediate resort to a U.S. District Court Judge, ensures compliance with all federal and state discharge requirements.

Comment 5: Page 2, paragraph 3.

We believe that this non-compliance will result in the disposal of polluted groundwater near Plainview Water District wells.

State Response to Comment 5

"Polluted" groundwater will not be deposited near Plainview wells. As stated above, the water, whether discharged from the treatment facility of Alternative No. 7 or the RRF (if permitted and allowed to accept recovery water), will be required to meet all applicable discharge criteria. If the discharge water does not meet those criteria, the consent decree will provide that the State can shut down the cleanup operation (the recovery wells) until the Town makes sufficient modifications and adjustments to meet consent decree standards.

Furthermore, regardless of the contaminant levels in the discharge water, it will not reach the Plainview public drinking wells which are 2500 feet hydraulically upgradient of the point of discharge. As explained in greater detail in the response to the groundwater consultant to the Water District, calculations have been made to demonstrate that this recharged water will not reach the Plainview wells. In addition, monitoring well(s) will be placed between the point of discharge and the Plainview wells to insure that these calculations are accurate and that no impact will occur on the Plainview wells. If either discharge violations occur or the monitoring wells indicate a potential impact on Plainview wells, the cleanup program will be shut down immediately until appropriate modifications are made or, if necessary, a new discharge location is found.

We again wish to thank you for your comments and your participation in this public process. We have provided with this letter the entire package of written responses to all comments made at the public meetings and as submitted in writing.

After considering all the public comments received to date, the State has formally selected Alternative No. 7 as the appropriate remedial alternative for this site. This selection will now be submitted to the United States Environmental Protection Agency for review and concurrence consistent with current regulation and policy. If that concurrence is obtained, the remedial alternative will be set forth in more detail in a Remedial Action Plan which will be attached to a Consent Decree resolving the pending litigation. This Consent Decree will provide for remediation of the landfill and set forth the obligations of all the parties with respect to that remediation. The Remedial Action Plan and the Consent Decree will be subject to a public comment period prior to final approval by the United States District Court. Copies of these documents will be provided to the public on a timely basis.

Sincerely,

ROBERT L. OSAR
E. GAIL SUCHMAN
Assistant Attorneys General

RLO:rl
Enclosures

OLD BETHPAGE PTA

ROUND SWAMP ROAD, OLD BETHPAGE, NEW YORK 11804

September 20, 1987

Ms. E. Gail Suchman
Assistant Attorney General
Environmental Protection Bureau
120 Broadway
New York, New York 10271

Dear Ms. Suchman:

I know that you wanted any responses on the "Remedial Action Feasibility Study" and "The Evaluation of Air Stripper Emission Impacts on Air Quality on the Oyster Bay Solid Waste Disposal Complex" by September 15th. Since I had just received my copy on September 10th and wanted to consult with our expert for their opinions, it was impossible to compile my comments that quickly. I hope you will still be able to take this under consideration.

As to the Air Emission Study, we have two comments - First, when working with the modeling approach there are certain drawbacks, the input parameters can be adjusted to have the desired results referring to Table 2.2 on Page 5 where the Air Stripper Emissions Data are tabulated with all the maximum emission rates falling well below the problem amounts. What if the original amounts guessed were inaccurate? What if the amounts are much higher than expected going into the air strippe wouldn't that change the emission rate possibly drastically? Secondly, no where in this report is there any mention of the od situation caused by air stripping. Even if the expected amounts are accurate and we don't have to worry about inhaling toxic emissions, when you blow off these constituents into the air,-th smell would have to be horrendous. This will impact seriously on the entire neighborhood abutting the landfill.

Our last comment has to do with the sludge. The plan placing this sludge back into the same landfill seems short-sighted. This sludge is going to be loaded with toxic contamina and, therefore, should be treated as hazardous waste and dispose of accordingly.

On behalf of our senior citizens, as well as the children of the Old Bethpage Grade School, and all of the other residents of our community, we suggest that this problem must be given careful consideration.

Once again, we appreciate the time delay and hope that you will be able to give my comments your consideration.

Sincerely yours,

OLD BETHPAGE PTA

Ellen Levine

Ellen Levine
President

EL/ltc

Copy To: Assemblyman Lewis J. Yevoli
RAGE
Plainview-Old Bethpage Central
School District

STATE OF NEW YORK
DEPARTMENT OF LAW
120 BROADWAY
NEW YORK, NY 10271

ROBERT ABRAMS
Attorney General

JAMES A. SEVINSKY
Assistant Attorney General in Charge
Environmental Protection Bureau

(212) 341-2461

October 27, 1987

Ellen Levine
President
Old Bethpage Grade School PTA
Round Swamp Road
Old Bethpage, NY 11804

Re: Comments on Old Bethpage
Landfill Remedial Action
Feasibility Study

Dear Mrs. Levine:

Thank you for your participation in the public meeting on September 10, 1987, and for your letter of September 20, 1987, providing specific comments on the Old Bethpage Landfill Remedial Action Feasibility Study and the proposed cleanup plan, Alternative No. 7. We have set forth below the comments from your letter and the responses of the State.

Comment No. 1: With respect to the study conducted by consultants to the Town of Oyster Bay to evaluate the air impacts of the groundwater treatment system (the air stripper), the modeling approach assumes that certain input parameters (i.e., the contaminant levels in the groundwater to be treated) will be met. If these contaminant levels are higher than assumed, won't the impacts of the air emissions from the stripper be changed drastically?

Response No. 1

As stated at the public meeting and in the other written comments attached herewith, extensive chemical analyses were performed on the plume of contamination emanating from the landfill. These analyses demonstrate that the plume, although large in size, does not contain a high concentration of contaminants. As this plume is pumped through the recovery wells, the contaminated groundwater will be mixed with significant amounts of clean water.

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Therefore, the recovery water obtained from this plume initially will contain a relatively low concentration of chemicals. These low concentrations will be reduced furth by treatment of the groundwater prior to discharge. Calculations were performed to estimate the anticipated levels of contaminants in the air and water discharge after treatment.

Every calculation performed in the feasibility study and subsequent studies, including the latest modeling effort, assumed a worst case scenario, i.e., the worst contamination in the plume (plus a 30 percent safety factor) would have to be treated continuously and the worst treatment conditions would prevail continuously. Even under these worst case conditions, these calculations demonstrated that the air discharge in this remediation will fall well below acceptable standards. As further assurance, the Town will be required by the Consent Decree to meet those standards. Therefore, even if the projected calculations are in error, the Town will be required, regardless of cost and effort, to modify and adjust its treatment system until it meets the required air discharge standards. The State will not allow the system to continue operation unless it meets all appropriate standards.

In short, the studies have shown, based upon the known chemical concentration of the plume, that the air and wate discharge standards will be met. More importantly, regardless of what the studies indicate, the Town will be required, as a matter of legal obligation in the Consent Decree, subject to enforcement by a United States District Court Judge, to meet those air and water discharge requirements. There is neither a factual nor a legal reason to believe that the air emission levels associated with this remediation will cause adverse impact on the community.

Comment No. 2: The odor from these air emissions will be horrendous.

Response No. 2

As stated above, the air emissions emanating from the air stripper will be substantially below relevant standards. Furthermore, the modeling study demonstrates that the maximum impact of these air emissions will occur within the boundaries of the landfill property. There will be no significant impact on the surrounding communities. The presence of odors is directly related to the concentrations of contaminants in the air emissions. Since the maximum impact of these low level air emissions will be well within the landfill boundary, the air stripper emissions will no create an odor problem beyond the landfill.

Subsequent to receipt of your written comments, we asked the Town's air modeling consultant to conduct an odor threshold analysis for the air stripper emissions to reconfirm that there is no potential odor problem offsite. The consultant compared peak short term emissions at the landfill boundary to recognized odor thresholds for a number of chemical compounds existing in the landfill plume. The study demonstrated that no odor thresholds were exceeded beyond the landfill boundary. In other words, at the concentrations to be emitted by the air stripper, no odors will be detectable offsite.

If through actual operation of the air treatment system, air emissions do not meet appropriate air standards, the Town will be required to modify the system until such standards are met. Furthermore, it is important to note that because the landfill will be capped with a clay cover and the methane gas collection system continued as part of this remediation, its overwhelming impact will be to reduce odors from the landfill, not increase them.

Comment No. 3: The plan placing sludge back into the same landfill seems shortsighted. This sludge is going to be loaded with toxic contaminants.

Response No. 3

We assume that the sludge referred to in your comment is the sludge from the leachate collection system, discussed on page 1-4 of the Remedial Action Feasibility Study. This collection system, operating since 1983, removes metals and solids from collected landfill leachate.- The sludge generated consists primarily of the treatment agent, hydrated lime, and small amounts of metals and solids. The system produces about six cubic yards of sludge per year, the equivalent of approximately four 55-gallon drums.

The practice of the landfill operators has been to place the sludge back in the landfill. If this sludge generates new leachate, it will be recaptured and retreated through the leachate collection system. For the future, however, the State will require, in the Consent Decree, that the sludge no longer be deposited back in the landfill. Instead, the sludge will be transported to an approved waste disposal facility as long as the leachate collection system continues to operate. Once the landfill is capped, the Town's consultant has estimated that generation of leachate will cease in approximately five years after capping.

We again wish to thank you for your comments and your participation in the public process. We have provided with this letter the entire package of written responses to all comments made at the public meeting as well as those submitted in writing.

After considering all the public comments received to date, the State has formally selected Alternative No. 7 as the appropriate remedial alternative for this site. This selection will now be submitted to the United States Environmental Protection Agency for review and concurrence consistent with current regulation and policy. If that concurrence is obtained, the remedial alternative will be set forth in more detail in a Remedial Action Plan which will be attached to a Consent Decree resolving the pending litigation. The Consent Decree will provide for remediation of the landfill and set forth the obligations of all the parties to that litigation with respect to that remediation. The Remedial Action Plan and Consent Decree will be subject to a public comment period prior to final approval by the United States District Court. Copies of these documents will be provided to the public on a timely basis.

Sincerely,

ROBERT L. OSAR
E. GAIL SUCHMAN
Assistant Attorneys General

RLO,EGS:cw
Enc.
RLO:EGS:cw

H2M GROUP

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DEPARTMENT OF LAW
ENVIRONMENTAL PROTECTION
BUREAU — N.Y.C.

September 24, 1987

Robert Osar, Esq.
New York State of Law
120 Broadway
New York, New York 10271

Re: Old Bethpage Landfill
Remedial Action Feasibility Study

Dear Mr. Osar:

This letter constitutes the written comments of the Plainview Water District in response to the July 15 and August 17, 1987 notices of the Department of Law. These comments are intended to supplement the oral remarks presented at public hearings of September 10 on behalf of the Board of Commissioners of the Plainview Water District.

Background

Holzmacher, McLendon and Murrell, P.C. (H2M) has served as consulting engineers for the Plainview Water District for over thirty years (January, 1955). In that capacity, we have designed much of what today constitutes the Plainview Water District. H2M's responsibilites have included design of their wells, production plants, treatment and storage facilities and the distribution system. H2M has been intimately involved with the planning and development of the District. I have served as our firms' engineer for Plainview for over six years. I am a licensed professional engineer with over twenty years experience and an officer (Vice President) at H2M.

Statement

The Board of Commissioners entirely supports the concept of actively remediating the contamination affecting groundwater southeast of the landfill. It is their view that remediation must include at a minimum the removal of contaminated groundwater, its treatment and recharge. The remediation plan must prevent the further spread of contamination into the Magothy aquifer.

The Board holds that the issues raised in the Remedial Action Feasability Study (RI/FS) must be held separate from those of the resource recovery plant. This conforms to the views expressed by you at the two public hearings held on the subject. Any opinions raised on the need for remediation at the landfill site or the merits of the alternatives proposed by the Town through its consultants must be considered only in the narrow context of the RI/FS. The District is concerned by the tenor of a number of alternatives set forth in the RI/FS, specifically alternative No. 7.

In regard to alternative No. 7, the District feels that there is a decided bias in conjunction with an on site resource recovery plant. In fact this alternative appears to have an ulterior purpose - providing a source of supply water for the proposed resource recovery plant. The District opposes having RI/FS alternatives tied into this separate matter, directly or indirectly, and requests assurances that no such tie in is contemplated or will enter into the decision of the Department of Law.

It should be pointed out that the review of the RI/FS alternatives has been narrowly focused on the potential effects of the proposed action on well field No. 5 of the Water District. This well field on Winding Road is less than 1/2 mile north of the area proposed by the Town in alternative No. 7 for recharge of treated groundwater. Well field No. 5 has four active public water supply wells with an approved total capacity in excess of 8 million gallons per day. This well field furnishes about forty percent of the capacity of the Plainview Water District.'

Geraghty & Miller, Inc. prepared a letter report dated September 8, 1987 in response to expressed concerns regarding the potential effects of recharging 1-1/2 million gallons so near to plant No. 5. Their analysis indicates effects more than half way to plant No. 5 and this is without taking into account the down stream influence of plant No. 5's pumpage. Despite assurances that monitoring will be provided and that the Plainview Water District will have input into the monitoring plan, the District remains uncomfortable with the proximity of the proposed recharge. The District would prefer a greater distance and believes that alternative No. 5 should be selected for accomplishing groundwater cleanup.

Alternative No. 5 provides the same groundwater remediation benefit at much less risk to the Plainview Water District and at significantly lower cost. The RI/FS report provides no technical argument against this option. Evidently, according to the RI/FS, alternative No. 5 will allow for maintaining a suitable hydraulic barrier. Further, since the contaminated water is to be treated to groundwater class GA recharge standards, there should be no problem with groundwater quality impacts. The concept of treating the water continuously, as is suggested by alternative No. 7, has not been shown to provide a benefit sufficient to justify the additional cost. This marginal benefit might very well be or should be accomplished through more efficient treatment in the first instance.

The cost data provided in the RI/FS indicates that alternative No. 7 will cost over one million dollars more than No. 5. The Plainview Water District would hope that the Attorney General's office would take into account the greater risk that alternative No. 7 presents, as well as the additional cost, particularly when no demonstrable benefit has been presented. It is for this reason that the District feels that the only justification for alternative 7 is the assistance it may provide for the proposed resource recovery plant.

The Plainview Water District appreciates the opportunity provided by the Department of Law to review and comment on the RI/FS.

Very truly yours,

HOLZMACHER, McLENDON & MURRELL, P.C.

John J. Molloy, P.E.

JJM:ls
cc: Bd of Commissioners, Plainview Water District
Larry Storm, Esq.

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JAMES A. SEVINSKY
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October 27, 1987

John J. Molloy, P.E.
Holzmacher, McLendon
& Murrell, P.C.
575 Broad Hollow Road
Melville, N.Y. 11787-5076

Re: Old Bethpage Landfill
Remedial Action
Feasibility Study

Dear Mr. Molloy:

Thank you for the comments set forth in your letter dated September 24, 1987, and received by our office on September 30, 1987, concerning the above referenced feasibility study. We understand these comments to supplement the oral remarks you made at the public hearing on September 10, 1987, and that both sets of comments were made on behalf of the Board of Commissioners of the Plainview Water District. Our responses in this letter will be directed specifically to the comments in your September 24 letter. To the extent that your oral comments at the meeting raised other issues not addressed by this letter, those comments have been responded to in the enclosed document entitled "Responses to Oral Comments."

Comment No. 1

You state at page 1: "The Board of Commissioners entirely supports the concept of actively remediating the contamination affecting groundwater southeast of the landfill. It is their view that remediation must include at a minimum the removal of contaminated groundwater, its treatment and recharge. The remediation plan must prevent the further spread of contamination into the Magothy aquifer."

Response to Comment 1

We thank the Board of Commissioners for its support of the method of active remediation chosen. The pump and treat remediation, providing for recharge of the treated groundwater, will achieve the goals the Board has emphasized, i.e., the removal and treatment of contaminated groundwater and the prevention of its spread, both horizontally and vertically.

Comment No. 2

The Board holds that the issues raised in the Remedial Action Feasibility Study must be held separate from the Town's proposal to build a resource recovery plant at the Landfill. The Board believes that the proposed remedial Alternative No. 7 will be used by the Town to provide a source of water for the proposed plant and therefore create a "bias" in favor of using the landfill site as the preferred location for the plant.

Response to No. 2

As stated in your letter, the State has reiterated on all occasions, in public and in writing, the firm position that the proposed remediation, Alternative No. 7, has been and will continue to be evaluated solely on its own merits. Similarly, the decision as to whether the proposed resource recovery plant will be located at the landfill is subject to an entirely separate Department of Environmental Conservation permitting process. The State has told the Town, throughout this remedial selection process, that it would not accept a remedial alternative which relied on the existence of the resource recovery facility for its operation. One of the reasons that Alternative No. 7 survived the selection process is that it did not rely on the existance of the resource recovery facility for its operation.

We fail to see a favorable "bias" for locating this plant at the landfill created by the selection of Alternative No. 7. You have indicated the Board's support for a pump and treat/recharge system. Any of the pump and treat alternatives, no matter where the recharge is located, will provide a potential source of water for the resource recovery facility. The projected cost of the resource recovery facility is over 150 million dollars. The cost of piping from the recovery wells to the proposed location of the plant is approximately one million dollars. Obviously, in a project of this size, the one million dollar cost of piping is inconsequential. Additionally, there already exists a well (originally used for the now closed incinerator) on the landfill property which could be used as a water source for the proposed plant.

Finally, and most importantly, the Town cannot obtain approval to locate the resource recovery plant at the landfill without meeting a host of legal, technical, and environmental permit and policy criteria. The mere availabilty of water at the site is an insignificant, if not irrelevant, fact in meeting those exacting criteria.

Comment No. 3

The Board expresses its continued concern that the recharge water from Alternative No. 7 is too close to the public drinking wells in the District's Well Field No. 5, and therefore may impact those wells.

Response to Comment No. 3

Plainview Well Field No. 5 is 2500 feet upgradient of the recharge location proposed in Alternative No. 7. The Town's groundwater consultant, Geraghty & Miller (G&M), has prepared mounding calculations, presented to you, which have demonstrated that the Alternative No. 7 recharge water will have no impact on the groundwater beyond a point which is, at a maximum, 1300 feet upgradient of the recharge. This point, i.e, the "stagnation point", is at least 1200 feet downgradient from the nearest Plainview water supply well. The State has accepted these calculations. You have not provided us with any information which would indicate to us that these calculations are in error.

You state in your letter that the G&M analysis did not take into account the "down stream influence" of Well Field No. 5's pumpage. That statement is literally accurate but not technically accurate. The information you have provided to the State and the Town indicates that the nearest public well pumps at a depth of over 550 feet in the aquifer. In contrast, the Alternative No. 7 recharge will be occurring in the upper portion of the aquifer at depths of only 40-50 feet. There is no technical reason to take "down stream" impact of Well Field No. 5 into account in the mounding calculation because, not only are the wells in Field No. 5 located at a substantial distance upgradient from the stagnation point calculated for the recharge, they are also influencing a deeper portion of the aquifer than the mound of the recharge. Therefore, there is no basis for our technical staff to assume a greater vertical impact from this recharge mound on the Plainview wells. This issue has been raised on numerous occasions in the course of our discussions with you over the last two months. You have provided us with no information or calculation which would cause the State to alter its assessment. If you have any information or calculation which demonstrates a greater vertical impact, we would of course expeditiously consider it.

Additionally, as stated in your letter, groundwater monitoring will be conducted to verify the G&M calculations and the true impact of any recharge mounding. The final consent decree will provide that, if there is any demonstration of threat to the public drinking wells, the Town will immediately cease operation of the remedial program at the State's demand until the threat is eliminated. As we stated at the public meeting and in our previous discussions, you are welcome to participate in the development of a monitoring program to define the mounding effects of the Alternative No. 7 recharge.

Comment No. 4

The Board believes that Alternative No. 5 should be selected as the appropriate remedial plan. The Board points out that the feasibility study raises no technical argument against that option and since the recharge water will be relatively free of contamination, it will not impact groundwater quality. The Board points out that Alternative No. 5 will cost approximately one million dollars less than Alternative No. 7.

Response to Comment No. 4

The State strongly disagrees with the Board's preference for Alternative No. 5 and will attempt below to point out all the reasons why Alternative No. 5 is less desirable from an environmental, technical, and public health standpoint than Alternative No. 7. In pointing out these reasons, we must admit that all of them were not specifically articulated in the remedial feasibilty study itself. The feasibility study is a document which resulted from a long and detailed negotiation and technical dialogue between the Town and the State. All the preliminary discussions which transpired are not set forth in that document. The document for the most part presented the "conclusions" of that process. Many of these reasons were, however, presented by the State at the public meeting (September 10) in the discussion of the rejection of Alternative No. 5. A reconsideration of the appropriateness of Alternative No. 5 after the September 10 meeting has reconfirmed the reasons for its rejection.

Alternative No. 5, in general terms, searched for a recharge location close to the recovery wells so that the cost of piping the water back to the landfill could be avoided. In our initial discussions of this alternative, the technical staffs of the State and the Town agreed that any potential Alternative No. 5 recharge location must meet two preconditions: 1) the location could not interfere with the efficiency of the recovery wells themselves; and 2) the recharge could not be located in an area potentially impacted by two other suspected (since confirmed) sources of

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contamination to the east and west of the landfill, the Nassau County Fireman's Training Facility (west) and Claremont Polychemical (east).

The first criterion eliminated any location within approximately 2500-3000 feet of the pumping wells, the estimated combined impact of the recharge and the cone of influence of the pumping wells. (Unlike the Plainview Well Field No. 5, these recovery wells would be pumping at a depth closer to that impacted by the recharge mounding, see Response to Comment No. 3). Basic elements of the calculations demonstrating the need for approximately 2500-3000 feet of separation were verified in the recent field pump test. Since it is required that the these recovery wells create a hydraulic barrier for the plume of contamination, the addition of a mounding effect to this cone of influence would, in the opinion of the State and Town, diminish the effectiveness of the required hydraulic barrier. Due to the proximity to the landfill plume of the Fireman's Training Center and Claremont sources of contamination, locations east and west of the landfill plume and downgradient of those sources were similarily rejected.

Therefore, the only area left for potential recharge under Alternative No. 5 was the southernmost portion of th Bethpage State Park, an area currently used as a public go course. Since approximately five acres of contiguous land would be needed to construct such a treatment and recharge system, the feasibility study focused on the "institutional problem" inherent in attempting to locate a five acre recharge system in the middle of a public golf course. This reason alone provided a sufficient basis for the State to reject Alternative No. 5, particularly when an acceptable and preferable recharge location existed on the landfill itself, upgradient of the recovery wells (Alternative No. 7).

There are certainly other reasons why Alternative No. 5 should be rejected. In fact, one of the reasons in support of Alternative No. 7 is a reason for the rejection of Alternative No. 5.

Alternative No. 7 is preferable because it keeps all the discharge water, even if only "slightly contaminated," within the groundwater containment system thereby creating a closed system. This allows for the continuous recapture and retreatment of the contaminated water. Furthermore, the reinjection of water in the system will speed the cleanup of the plume by "pushing" it more quickly toward the recovery wells. In contrast, Alternative No. 5 would place the slightly contaminated discharge water outside the containment system, at a point only 1000 feet upgradient of the nearest District of Farmingdale public drinking wells. Since this discharge point is upgradient of those wells, it would have the potential to reach those wells. This situation differs from that in Alternative No. 7 in which the discharge point is "downgradient" of the Plainview wells and contamination will not move upgradient past the stagnation point. The additional treatment of the Alternative No. 7 discharge water at no increased cost (your suggestion of further treatment of the Alternative No. 5 discharge water would require significantly increased treatment costs) is certainly cost-effective and a desirable environmental result.

The discharge location in Alternative No. 5 is also of concern if the treatment facility should malfunction thus temporarily placing contaminated groundwater only 1000 feet upgradient of public wells. This is not a concern with respect to Alternative No. 7 because this contaminated water would not move past the upgradient stagnation point. Additionally, even if monitoring did indicate movement of contamination past the stagnation point, the pumping and recharge system could be temporarily shut off allowing the contaminated recharge water to flow back into the downgradient regional flow. Any contaminated water released at the discharge location in Alternative No. 5 could not be recaptured without installing a new remedial system at great expense.

In sum, we disagree with your conclusion that Alternative No. 7 presents no demonstrable benefit over Alternative No. 5. We believe that Alternative No. 7 represents no risk that can be demonstrated at this time and can be monitored and easily remedied if any risk appears. It provides a contained environmental cleanup which is of significant environmental benefit both in the speed and degree of cleanup. The only possible discharge location for Alternative No. 5 (the other locations are technically and environmentally unacceptable) is institutionally unreasonable since the land is currently a public golf course. Furthermore, problems which may occur at the Alternative No. 5 discharge location and which might present environmental or health risks may not be so easily remedied. Such risks are not acceptable in view of a demonstrated alternative. The decision to select Alternative No. 7 is soundly based and is not connected in any way with the potential location of the resource recovery facility.

We again wish to thank you for your comments and your participation in this public process on behalf of the Plainview Water District. We have provided with this letter the entire package of written responses to all comments made at the public meetings and as submitted in writing.

After considering all the public comments received to date, the State has formally selected Alternative No. 7 as the appropriate remedial alternative for this site. This selection will now be submitted to the United States Environmental Protection Agency for review and concurrence consistent with current regulation and policy. If that concurrence is obtained, the remedial alternative will be set forth in more detail in a Remedial Action Plan which will be attached to a Consent Decree resolving the pending litigation. The Remedial Action Plan and the Consent Decree will be subject to a public comment period prior to final Court approval. We will contact you directly, however, as soon as a proposal exists for the upgradient monitoring of Alternative No. 7.

Sincerely,

ROBERT L. OSAR
E. GAIL SUCHMAN
Assistant Attorneys General

Enclosures

RLO/EGS:bjs

EXHIBIT C

STATE RESPONSES TO ORAL COMMENTS
REMEDIAL ACTION FEASIBILITY STUDY
OLD BETHPAGE LANDFILL, BETHPAGE, NY

The State of New York held two public meetings to discuss the Remedial Action Feasibility Study and the recommended remedial alternative for the Old Bethpage Landfill. The purpose of the first meeting, held at Plainview-Old Bethpage High School on July 23, 1987, was to 1) explain in detail the groundwater investigation conducted at the landfill, 2) define the environmental problem identified, 3) present the remedial feasibility study prepared by consultants for the Town of Oyster Bay, and 4) describe in detail the recommended cleanup proposal. Approximately seventy-five (75) people attended the meeting. Comments and questions were taken and a transcript made. This meeting lasted for approximately four hours. A second public meeting was held on September 10, 1987, at the Kennedy High School in Plainview, to receive formal comments on the feasibility study and recommended cleanup. Approximately fifty (50) people attended this second meeting which lasted approximately two and a half hours. Transcripts of both meetings and all documents referenced in these responses will be made available at the Plainview Public Library.

At the first public meeting, the bulk of the comments focused on the short period of time (one week) provided for review of the feasibility study prior to the meeting. It was also requested that the comment period be extended beyond the summer vacation period. In response to those comments, the public comment period was extended to September 15, 1987, and the second meeting was scheduled for September 10, 1987.

Since the purpose of the first meeting was to provide information to the public, a consultant for the Town provided a detailed presentation, through slides, maps, and technical information, which described the investigation conducted, its results, and the various cleanup proposals. Many of the public comments and questions at the meeting were directed to the technical issues presented. These questions were answered by the Town's consultants and the State's legal and technical representatives, as reflected i the transcript. Several comments presented at the first meeting were reiterated at the second meeting or in the written comments received.

A brief description of significant comments and questions presented at both meetings is set forth below. This listing does not include the initial comments solely concerning scheduling matters which are no longer relevant in view of the State's agreement to extensions. In order to avoid repetition, if a comment listed below has been addressed elsewhere in this document or in response to written comments, only a reference to that response will b indicated.

July 23, 1987 Public Meeting

Comment: Anna Goidell, President, Plainview-Old Bethpage School Board

What guarantee is there that the hydraulic containment system in the proposed cleanup plan will be effective?

State Response

Modeling studies and calculations were performed by the Town's groundwater consultants which indicate that the "pump and treat" system described in the feasibility study will be effective in maintaining hydraulic control of the contaminated groundwater plume. Actual pump tests conducted in the field this summer have verified the input data of the model and those calculations. More importantly, the Town will be legally required, under a consent decree resolving the pending litigation, to achieve and maintain effective hydraulic control. The proposed consent decree provides that the Town will be required to modify, enchance, and repair the system to achieve and maintain this control. Failure to do so will constitute a violation of the consent decree which can be enforced expeditiously by the Federal Judge who will maintain jurisdiction over the consent decree.

Comment: Julius Wallach

Where do the contaminants end up after the air stripping process?

State Response

The recommended remediation initially utilizes an air stripping process to treat the contaminated groundwater. The treatment process volatilizes the contaminants in the groundwater and disperses them into the air. Calculations and modeling have demonstrated that the treatment facility (air stripper) will meet all applicable air standards. The consent decree will require the Town to meet and maintain compliance with those standards. Continued compliance will be monitored. For further, more detailed discussion, see the State's October 27, 1987 letter to Ms. Ellen Levine, Response to Comment No. 1, enclosed herewith as attachment 1.

Comment: Carol Spielberger

Why is a "Proposed Resource Recovery Facility" depicted on the maps included in the feasibility study? Has the

State looked at discharge locations for the treated water other than that set forth for the recommended remediation, Alternative No. 7.

State Response

See extensive responses provided in the State's October 27, 1987 letter to Mr. John Molloy, Response to Comment Nos. 2 and 4, and the October 27, 1987 letter to Ms. Anna Goidell, Response to Comment Nos. 1 and 2, both letters enclosed herewith as attachments 2 and 3, respectively.

Comment: Ellen Levine, PTA President

What will be the impact of air emissions from the cleanup on the community?

State Response

See responses provided in the State's letter of October 27, 1987 to Ms. Ellen Levine, Response to Comment Nos. 1 and 2 (attachment 1).

Comment: Assemblyman Lewis T. Yevoli

Assemblyman Yevoli requested information concerning the credentials of one of the Town's consultants, Lockwood

Kessler and Bartlett (LKB), and its experience in hazardous waste site cleanups. He also asked whether the State took split samples during the groundwater investigation program and whether sampling results indicated any contamination to the north of the landfill resulting from "mounding".

State Response

The Town of Oyster Bay has provided the State with a packet prepared by LKB in response to Assemblyman Yevoli's request for LKB's professional credentials and experience. It is enclosed herewith as attachment 4. In response to the other comments, the State undertook extensive split sampling and independent laboratory analysis during the landfill investigation. This effort confirmed the sampling results obtained by the Town. The results of all sampling to date have not shown any significant contamination north of landfill resulting from mounding. Monitoring will be conducted during the remediation to continue to confirm this assessment.

Comment: Marlene Mendelsohn, Residents Against Garbage Expansion (RAGE)

Is there a possibility that the groundwater plume of contamination from the landfill is moving in a direction other than the direction identified in the investigation?

State Response

Principles governing movement of groundwater, in conjunction with the voluminous data, particularly water level measurements, obtained in the remedial investigation, show that groundwater under the landfill is moving toward the south-southeast. This conclusion is consistent with what has been shown in other studies to be the regional groundwater flow in this area. There is no evidence of any significant component of groundwater flow in a direction inconsistent with this regional flow.

Comment: Ugo Perzan

Mr. Perzan asked a number of specific technical questions. The major questions are as follows:

1) Based upon the estimate that the groundwater in the Long Island aquifer moves approximately one foot per day, why hasn't the plume of contamination extended over a mile horizontally from the landfill by this time?

2) Recognizing possible contribution to the plume from industrial sources in the Claremont road area [to the east], why is there contamination at well N-189 [to the west]? Since well N-189 is a shallow well, is there a

possibility that shallow constituents are moving in a different direction than deeper constituents?

3) Was the use of leachate indicators a proper way to define the plume of contamination at this landfill?

5) Was the Random Walk model used to demonstrate the distribution of the plume? Was the model calibrated to consider the low levels of contamination found in the plume?

State Response

Mr. David Miller of Geraghty and Miller (G & M), the Town's groundwater consultant, answered all of Mr. Perzan's questions at the public hearing. The State generally concurs with the answers he provided. Mr. Perzan did not provide any followup comments at the September 10, 1987 public meeting or in writing to the State. The answers to his questions are available for review in depth in the transcript of the July 23rd meeting at pages 67-77 and 86-90. Briefly, the State's responses to the above questions are as follows:

1) The groundwater investigation downgradient of the landfill showed the rate of groundwater flow in that area to be less than one foot per day. Furthermore, contaminants do not move at the same rate as groundwater.

Contaminants cling to particles of sand and other soil materials as they move through the groundwater thereby slowing their migration. This slowing of contaminants is called retardation and the rate of retardation is one factor in measuring the rate of contaminant movement per day as opposed to groundwater flow per day.

2) Well N-189 is located in and controlled by the Bethpage State Park. That well was closed to further use in 1984. It is directly downgradient of the Nassau County Fireman's Training Center ("FTC"). Based on current data, it is more likely that the low levels of contamination found in this well resulted from the FTC or an unknown local source than from the landfill plume.

3) It was agreed by the State and Town that sampling for known landfill leachate indicators was an appropriate investigating tool to define the leachate plume emanating from this municipal landfill. Once the leachate plume from the landfill was defined, the wells in that plume were sampled for a full range of organic and inorganic chemicals. This approach was effective in defining a distinct plume of organic and inorganic contamination emanating from the landfill as opposed to contamination from other potential sources in the area such as Claremont Polychemical to the east and the Fireman's Training Center

to the west. Although the landfill leachate plume is larger than the organic and inorganic plume being remediated, the leachate indicators found outside the area to be remediated do not exceed State groundwater standards.

4) There are several acceptable computer models capable of demonstrating the distribution of the contaminant plume. Random Walk is one. The Town's consultant, G & M, utilized the Prickett-Lonnquist model. A field pump test was conducted this summer which verified certain input used in that model. This field data has provided both State and Town technical personnel with a certain degree of confidence in the anticipated effectiveness of the remedial program. It is important to note, however, that modeling only a predictive tool. Extensive monitoring has yielded data on the actual contaminant levels in the groundwater. Future monitoring will continue to define those levels of contamination and the effectiveness of the cleanup.

Comment: Mary DeKanner

Is there a connection between the remedial plan and the proposed resource recovery facility?

State Response

See extensive responses provided in the State's October 27, 1987 letter to Mr. John Molloy (attachment 2), Response to Comment No. 2, and the October 27, 1987 letter to Ms. Anna Goidell (attachment 3), Response to Comment No. 1.

Comment: Brian Culhane, State Legislative Commission On Water Resources

Will the recharge of the recovery water upgradient of the landfill cause a mounding problem under the landfill and cause more leachate?

State Response

Calculations performed by the Town's consultant have indicated that water levels due to recharge will not rise sufficiently to result in groundwater contacting refuse in the landfill. Furthermore, the recommended remedial alternative, which will recharge treated groundwater upgradient of the landfill and the recovery wells, provides for a hydraulic system to contain and treat all groundwater contaminated by the landfill until cleanliness standards are met. Therefore, if the recharge should produce new leachate, the Town will need to adjust its recharge to prevent new leachate formation or continue pumping its system as long as leachate production continues.

Comment: Russ Haven, New York Public Interest Research Group

Referring to the number of wells used to investigate groundwater contamination on industrial sites in western New York and to Department of Environmental Conservation estimates of the costs of cleaning up municipal landfills, not enough wells were used to define the contamination problem at the landfill and the estimated cost of the cleanup, $7 million, is too low.

State Response

As described by Mr. Miller, 46 wells were used to evaluate the groundwater contamination emanating from the landfill. State technical staff were involved in the formulation and implementation of the remedial investigation which yielded reliable results. The $7 million figure represents solely the estimated cost of the cleanup of the groundwater plume. The entire cost of remediating the landfill, estimated to be about $20 million, is comparable to DEC estimates.

Comment: Ron Dimonda

How long will the cleanup take?

State Response

The Town's consultant has estimated approximately ten years for cleanup. The consent decree will require the Town conduct the cleanup until the termination criteria of the decree are met.

September 10, 1987 Public Meeting

Comment: John Molloy, on behalf of the Plainview Water District

The Board of Commissioners supports the concept of fully remediating the contamination affecting groundwater southeast of the landfill by utilizing a pump, treat and recharge system. The Board is concerned about the impact of the recharge of the treated recovery water on the Plainview public drinking wells, one-half mile upgradient of the recharge. The Board requests a commitment to monitoring upgradient of the recharge and wishes to have input into the development of the monitoring plan, assuming the recommended remedial alternative calling for recharge upgradient of the landfill is chosen (Alternative No. 7). The Board considers recharge in the State Park downgradient of the landfill to be a better alternative (Alternative No. 5). The Board requests that all data and reports developed during the remediation program be provided to the Board. The Board requests a commitment for full reimbursement by the State of all expenses incurred in correcting any drinking water problem in the Plainview wells caused by the remediation.

State Response

With the exception of the last two comments, all of Mr. Molloy's comments have been addressed in the State's Octobe 27, 1987 letter to Mr. Molloy (attachment 2). In response to Mr. Molloy's last two comments, all data and reports generated as a result of the remediation will be made available to the Board. Upgradient monitoring wells will provide an effective warning system, so that contamination, if any, will be prevented from migrating toward the Plainview wells. (See State's letter to Mr. Molloy). Since there is no technical basis to assume that contamination will reach these wells, there is no basis to request the State to commit to provide compensation for "hypothetical damage".

Comment: Assemblyman Lewis J. Yevoli

Assemblyman Yevoli expressed concern about the Town's future attempt to connect the recommended remedial alternative and the proposed resource recovery facility for the landfill. [Messrs. Robert Goldstein Julius Wallach, Bernard Chetkoff, Bernard Abrams, Donald Rosen, and Ms. Ellen Levine expressed a similar concern.]

State Response

See extensive responses provided in the State's October 27, 1987 letter to Mr. John Molloy (attachment 2), Response to Comment No. 2, and the October 27, 1987 letter to Mrs. Anna Goidell (attachment 3), Response to Comment Nos. 1 and 4.

Comment: Robert Goldstein of RAGE

The cleanup plan must protect air and water and must be independently monitored. All data must be open to public inspection.

State Response

The State agrees with the above comments and will insure that these goals and requests are met.

Comment: Bernard Chetkof, Chairman of the Plainview Water District

Remedial Alternative No. 5 from the feasibility study should be chosen by the State instead of Alternative No. 7. [Mr. Jacques Wolfner expressed a similar concern].

State Response

See extensive responses provided in the State's October 27, 1987 letter to Mr. John Molloy (attachment 2), Response to Comment No. 4, and the October 27, 1987 letter to Ms. Anna Goidell (attachment 3), Response to Comment No. 2.

Comment: Ellen Levine, PTA President

Will the State consider Mr. Molloy's comments regarding Alternative No. 5? Has any new information been developed concerning possible air contamination from the air stripper?

State Response

The State has considered Mr. Molloy's comments regarding Alternative No. 5 and has responded in the October 27, 1987 letter to Mr. Molloy (attachment 2), Response to Comment No. 4. In response to the second question, the State provided Ms. Levine with a copy of a modeling study conducted by the Town's air consultant. This study is further discussed in the State's October 27, 1987 letter to Ms. Levine's (attachment 1), Response to Comment Nos. 1 and 2.

Comment: Jules Bernstein

Will capping of the landfill be included as part of the remediation. How long will the cleanup take? Does the $7 million cost included monitoring? Will the State check the results of the Town?

State Response

The landfill will be capped as part of the proposed remedial program. The remediation will continue until the State required termination criteria are met. The Town's consultant estimates that time to be approximately 10 years. The cost of the groundwater remediation includes a complete monitoring program the results of which will be checked and verified by the State.

Dated: October 27, 1987

STATE OF NEW YORK
DEPARTMENT OF LAW
120 BROADWAY
NEW YORK, NY 10271

ROBERT ABRAMS
Attorney General

JAMES A. SEVINSKY
Assistant Attorney General in Charge
Environmental Protection Bureau

(212) 341-2461

October 27, 1987

Ellen Levine
President
Old Bethpage Grade School PTA
Round Swamp Road
Old Bethpage, NY 11804

Re: Comments on Old Bethpage
Landfill Remedial Action
Feasibility Study

Dear Mrs. Levine:

Thank you for your participation in the public meeting on September 10, 1987, and for your letter of September 20, 1987, providing specific comments on the Old Bethpage Landfill Remedial Action Feasibility Study and the proposed cleanup plan, Alternative No. 7. We have set forth below the comments from your letter and the responses of the State.

Comment No. 1: With respect to the study conducted by consultants to the Town of Oyster Bay to evaluate the air impacts of the groundwater treatment system (the air stripper), the modeling approach assumes that certain input parameters (i.e., the contaminant levels in the groundwater to be treated) will be met. If these contaminant levels are higher than assumed, won't the impacts of the air emissions from the stripper be changed drastically?

Response No. 1

As stated at the public meeting and in the other written comments attached herewith, extensive chemical analyses were performed on the plume of contamination emanating from the landfill. These analyses demonstrate that the plume, although large in size, does not contain a high concentration of contaminants. As this plume is pump through the recovery wells, the contaminated groundwater will be mixed with significant amounts of clean water.

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Therefore, the recovery water obtained from this plume initially will contain a relatively low concentration of chemicals. These low concentrations will be reduced further by treatment of the groundwater prior to discharge. Calculations were performed to estimate the anticipated levels of contaminants in the air and water discharge after treatment.

Every calculation performed in the feasibility study and subsequent studies, including the latest modeling effort, assumed a worst case scenario, i.e., the worst contamination in the plume (plus a 30 percent safety factor) would have to be treated continuously and the worst treatment conditions would prevail continuously. Even under these worst case conditions, these calculations demonstrated that the air discharge in this remediation will fall well below acceptable standards. As further assurance, the Town will be required by the Consent Decree to meet those standards. Therefore, even if the projected calculations are in error, the Town will be required, regardless of cost and effort, to modify and adjust its treatment system until it meets the required air discharge standards. The State will not allow the system to continue operation unless it meets all appropriate standards.

. In short, the studies have shown, based upon the known chemical concentration of the plume, that the air and water discharge standards will be met. More importantly, regardless of what the studies indicate, the Town will be required, as a matter of legal obligation in the Consent Decree, subject to enforcement by a United States District Court Judge, to meet those air and water discharge requirements. There is neither a factual nor a legal reason to believe that the air emission levels associated with this remediation will cause adverse impact on the community.

Comment No. 2: The odor from these air emissions will be horrendous.

Response No. 2

As stated above, the air emissions emanating from the air stripper will be substantially below relevant standards. Furthermore, the modeling study demonstrates that the maximum impact of these air emissions will occur within the boundaries of the landfill property. There will be no significant impact on the surrounding communities. The presence of odors is directly related to the concentrations of contaminants in the air emissions. Since the maximum impact of these low level air emissions will be well within the landfill boundary, the air stripper emissions will not create an odor problem beyond the landfill.

Subsequent to receipt of your written comments, we asked the Town's air modeling consultant to conduct an odor threshold analysis for the air stripper emissions to reconfirm that there is no potential odor problem offsite. The consultant compared peak short term emissions at the landfill boundary to recognized odor thresholds for a number of chemical compounds existing in the landfill plume. The study demonstrated that no odor thresholds were exceeded beyond the landfill boundary. In other words, at the concentrations to be emitted by the air stripper, no odors will be detectable offsite.

If through actual operation of the air treatment system, air emissions do not meet appropriate air standards, the Town will be required to modify the system until such standards are met. Furthermore, it is important to note that because the landfill will be capped with a clay cover and the methane gas collection system continued as part of this remediation, its overwhelming impact will be to reduce odors from the landfill, not increase them.

Comment No. 3: The plan placing sludge back into the same landfill seems shortsighted. This sludge is going to be loaded with toxic contaminants.

Response No. 3

We assume that the sludge referred to in your comment is the sludge from the leachate collection system, discussed on page 1-4 of the Remedial Action Feasibility Study. This collection system, operating since 1983, removes metals and solids from collected landfill leachate.- The sludge generated consists primarily of the treatment agent, hydrated lime, and small amounts of metals and solids. The system produces about six cubic yards of sludge per year, the equivalent of approximately four 55-gallon drums.

The practice of the landfill operators has been to place the sludge back in the landfill. If this sludge generates new leachate, it will be recaptured and retreated through the leachate collection system. For the future, however, the State will require, in the Consent Decree, that the sludge no longer be deposited back in the landfill. Instead, the sludge will be transported to an approved waste disposal facility as long as the leachate collection system continues to operate. Once the landfill is capped, the Town's consultant has estimated that generation of leachate will cease in approximately five years after capping.

We again wish to thank you for your comments and your participation in the public process. We have provided with this letter the entire package of written responses to all comments made at the public meeting as well as those submitted in writing.

After considering all the public comments received to date, the State has formally selected Alternative No. 7 as the appropriate remedial alternative for this site. This selection will now be submitted to the United States Environmental Protection Agency for review and concurrence consistent with current regulation and policy. If that concurrence is obtained, the remedial alternative will be set forth in more detail in a Remedial Action Plan which will be attached to a Consent Decree resolving the pending litigation. The Consent Decree will provide for remediation of the landfill and set forth the obligations of all the parties to that litigation with respect to that remediation. The Remedial Action Plan and Consent Decree will be subject to a public comment period prior to final approval by the United States District Court. Copies of these documents will be provided to the public on a timely basis.

Sincerely,

ROBERT L. OSAR
E. GAIL SUCHMAN
Assistant Attorneys General

RLO,EGS:cw
Enc.
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STATE OF NEW YORK
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October 27, 1987

John J. Molloy, P.E.
Holzmacher, McLendon
& Murrell, P.C.
575 Broad Hollow Road
Melville, N.Y. 11787-5076

Re: Old Bethpage Landfill
Remedial Action
Feasibility Study

Dear Mr. Molloy:

Thank you for the comments set forth in your letter dated September 24, 1987, and received by our office on September 30, 1987, concerning the above referenced feasibility study. We understand these comments to supplement the oral remarks you made at the public hearing on September 10, 1987, and that both sets of comments were made on behalf of the Board of Commissioners of the Plainview Water District. Our responses in this letter will be directed specifically to the comments in your September 24 letter. To the extent that your oral comments at the meeting raised other issues not addressed by this letter, those comments have been responded to in the enclosed document entitled "Responses to Oral Comments."

Comment No. 1

You state at page 1: "The Board of Commissioners entirely supports the concept of actively remediating the contamination affecting groundwater southeast of the landfill. It is their view that remediation must include at a *minimum* the removal of contaminated groundwater, its treatment and recharge. The remediation plan must prevent the further spread of contamination into the Magothy aquifer."

Attachment 2

Response to Comment 1

We thank the Board of Commissioners for its support of the method of active remediation chosen. The pump and treat remediation, providing for recharge of the treated groundwater, will achieve the goals the Board has emphasized, i.e., the removal and treatment of contaminated groundwater and the prevention of its spread, both horizontally and vertically.

Comment No. 2

The Board holds that the issues raised in the Remedial Action Feasibility Study must be held separate from the Town's proposal to build a resource recovery plant at the Landfill. The Board believes that the proposed remedial Alternative No. 7 will be used by the Town to provide a source of water for the proposed plant and therefore create a "bias" in favor of using the landfill site as the preferred location for the plant.

Response to No. 2

As stated in your letter, the State has reiterated on all occasions, in public and in writing, the firm position that the proposed remediation, Alternative No. 7, has been and will continue to be evaluated solely on its own merits. Similarly, the decision as to whether the proposed resource recovery plant will be located at the landfill is subject to an entirely separate Department of Environmental Conservation permitting process. The State has told the Town, throughout this remedial selection process, that it would not accept a remedial alternative which relied on the existence of the resource recovery facility for its operation. One of the reasons that Alternative No. 7 survived the selection process is that it did not rely on the existence of the resource recovery facility for its operation.

We fail to see a favorable "bias" for locating this plant at the landfill created by the selection of Alternative No. 7. You have indicated the Board's support for a pump and treat/recharge system. Any of the pump and treat alternatives, no matter where the recharge is located, will provide a potential source of water for the resource recovery facility. The projected cost of the resource recovery facility is over 150 million dollars. The cost of piping from the recovery wells to the proposed location of the plant is approximately one million dollars. Obviously, in a project of this size, the one million dollar cost of piping is inconsequential. Additionally, there already exists a well (originally used for the now closed incinerator) on the landfill property which could be used as a water source for the proposed plant.

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Finally, and most importantly, the Town cannot obtain approval to locate the resource recovery plant at the landfill without meeting a host of legal, technical, and environmental permit and policy criteria. The mere availabilty of water at the site is an insignificant, if not irrelevant, fact in meeting those exacting criteria.

Comment No. 3

The Board expresses its continued concern that the recharge water from Alternative No. 7 is too close to the public drinking wells in the District's Well Field No. 5, and therefore may impact those wells.

Response to Comment No. 3

Plainview Well Field No. 5 is 2500 feet upgradient of the recharge location proposed in Alternative No. 7. The Town's groundwater consultant, Geraghty & Miller (G&M), has prepared mounding calculations, presented to you, which have demonstrated that the Alternative No. 7 recharge water will have no impact on the groundwater beyond a point which is, at a maximum, 1300 feet upgradient of the recharge. This point, i.e, the "stagnation point", is at least 1200 feet downgradient from the nearest Plainview water supply well. The State has accepted these calculations. You have not provided us with any information which would indicate to us that these calculations are in error.

You state in your letter that the G&M analysis did not take into account the "down stream influence" of Well Field No. 5's pumpage. That statement is literally accurate but The information you have provided not technically accurate. to the State and the Town indicates that the nearest public well pumps at a depth of over 550 feet in the aquifer. In contrast, the Alternative No. 7 recharge will be occurring in the upper portion of the aquifer at depths of only 40-50 feet. There is no technical reason to take "down stream" impact of Well Field No. 5 into account in the mounding calculation because, not only are the wells in Field No. 5 located at a substantial distance upgradient from the stagnation point calculated for the recharge, they are also influencing a deeper portion of the aquifer than the mound of the recharge. Therefore, there is no basis for our technical staff to assume a greater vertical impact from this recharge mound on the Plainview wells. This issue has been raised on numerous occasions in the course of our discussions with you over the last two months. You have provided us with no information or calculation which would cause the State to alter its assessment. If you have any information or calculation which demonstrates a greater vertical impact, we would of course expeditiously consider it.

Additionally, as stated in your letter, groundwater monitoring will be conducted to verify the G&M calculations and the true impact of any recharge mounding. The final consent decree will provide that, if there is any demonstration of threat to the public drinking wells, the Town will immediately cease operation of the remedial program at the State's demand until the threat is eliminated. As we stated at the public meeting and in our previous discussions, you are welcome to participate in the development of a monitoring program to define the mounding effects of the Alternative No. 7 recharge.

Comment No. 4

The Board believes that Alternative No. 5 should be selected as the appropriate remedial plan. The Board points out that the feasibility study raises no technical argument against that option and since the recharge water will be relatively free of contamination, it will not impact groundwater quality. The Board points out that Alternative No. 5 will cost approximately one million dollars less than Alternative No. 7.

Response to Comment No. 4

The State strongly disagrees with the Board's preference for Alternative No. 5 and will attempt below to point out all the reasons why Alternative No. 5 is less desirable from an environmental, technical, and public health standpoint than Alternative No. 7. In pointing out these reasons, we must admit that all of them were not specifically articulated in the remedial feasibilty study itself. The feasibility study is a document which resulted from a long and detailed negotiation and technical dialogue between the Town and the State. All the preliminary discussions which transpired are not set forth in that document. The document for the most part presented the "conclusions" of that process. Many of these reasons were, however, presented by the State at the public meeting (September 10) in the discussion of the rejection of Alternative No. 5. A reconsideration of the appropriateness of Alternative No. 5 after the September 10 meeting has reconfirmed the reasons for its rejection.

Alternative No. 5, in general terms, searched for a recharge location close to the recovery wells so that the cost of piping the water back to the landfill could be avoided. In our initial discussions of this alternative, the technical staffs of the State and the Town agreed that any potential Alternative No. 5 recharge location must meet two preconditions: 1) the location could not interfere with the efficiency of the recovery wells themselves; and 2) the recharge could not be located in an area potentially impacted by two other suspected (since confirmed) sources of contamination to the east and west of the landfill, the Nassau County Fireman's Training Facility (west) and Claremont Polychemical (east).

The first criterion eliminated any location within approximately 2500-3000 feet of the pumping wells, the estimated combined impact of the recharge and the cone of influence of the pumping wells. (Unlike the Plainview Well Field No. 5, these recovery wells would be pumping at a depth closer to that impacted by the recharge mounding, see Response to Comment No. 3). Basic elements of the calculations demonstrating the need for approximately 2500-3000 feet of separation were verified in the recent field pump test. Since it is required that the these recovery wells create a hydraulic barrier for the plume of contamination, the addition of a mounding effect to this cone of influence would, in the opinion of the State and Town, diminish the effectiveness of the required hydraulic barrier. Due to the proximity to the landfill plume of the Fireman's Training Center and Claremont sources of contamination, locations east and west of the landfill plume and downgradient of those sources were similarily rejected.

Therefore, the only area left for potential recharge under Alternative No. 5 was the southernmost portion of th Bethpage State Park, an area currently used as a public gol course. Since approximately five acres of contiguous land would be needed to construct such a treatment and recharge system, the feasibility study focused on the "institutional problem" inherent in attempting to locate a five acre recharge system in the middle of a public golf course. This reason alone provided a sufficient basis for the State to reject Alternative No. 5, particularly when an acceptable and preferable recharge location existed on the landfill itself, upgradient of the recovery wells (Alternative No. 7).

There are certainly other reasons why Alternative No. 5 should be rejected. In fact, one of the reasons in support of Alternative No. 7 is a reason for the rejection of Alternative No. 5.

Alternative No. 7 is preferable because it keeps all the discharge water, even if only "slightly contaminated," within the groundwater containment system thereby creating a closed system. This allows for the continuous recapture and retreatment of the contaminated water. Furthermore, the reinjection of water in the system will speed the cleanup of the plume by "pushing" it more quickly toward the recovery wells. In contrast, Alternative No. 5 would place the slightly contaminated discharge water outside the containment system, at a point only 1000 feet upgradient of the nearest District of Farmingdale public drinking wells. Since this discharge point is upgradient of those wells, it would have the potential to reach those wells. This situation differs from that in Alternative No. 7 in which the discharge point is "downgradient" of the Plainview wells and contamination will not move upgradient past the stagnation point. The additional treatment of the Alternative No. 7 discharge water at no increased cost (your suggestion of further treatment of the Alternative No. 5 discharge water would require significantly increased treatment costs) is certainly cost-effective and a desirable environmental result.

The discharge location in Alternative No. 5 is also of concern if the treatment facility should malfunction thus temporarily placing contaminated groundwater only 1000 feet upgradient of public wells. This is not a concern with respect to Alternative No. 7 because this contaminated water would not move past the upgradient stagnation point. Additionally, even if monitoring did indicate movement of contamination past the stagnation point, the pumping and recharge system could be temporarily shut off allowing the contaminated recharge water to flow back into the downgradient regional flow. Any contaminated water released at the discharge location in Alternative No. 5 could not be recaptured without installing a new remedial system at great expense.

In sum, we disagree with your conclusion that Alternative No. 7 presents no demonstrable benefit over Alternative No. 5. We believe that Alternative No. 7 represents no risk that can be demonstrated at this time and can be monitored and easily remedied if any risk appears. It provides a contained environmental cleanup which is of significant environmental benefit both in the speed and degree of cleanup. The only possible discharge location for Alternative No. 5 (the other locations are technically and environmentally unacceptable) is institutionally unreasonable since the land is currently a public golf course. Furthermore, problems which may occurr at the Alternative No. 5 discharge location and which might present environmental or health risks may not be so easily remedied. Such risks are not acceptable in view of a demonstrated alternative. The decision to select Alternative No. 7 is soundly based and is not connected in any way with the potential location of the resource recovery facility.

We again wish to thank you for your comments and your participation in this public process on behalf of the Plainview Water District. We have provided with this letter the entire package of written responses to all comments made at the public meetings and as submitted in writing.

After considering all the public comments received to date, the State has formally selected Alternative No. 7 as the appropriate remedial alternative for this site. This selection will now be submitted to the United States Environmental Protection Agency for review and concurrence consistent with current regulation and policy. If that concurrence is obtained, the remedial alternative will be set forth in more detail in a Remedial Action Plan which will be attached to a Consent Decree resolving the pending litigation. The Remedial Action Plan and the Consent Decree will be subject to a public comment period prior to final Court approval. We will contact you directly, however, as soon as a proposal exists for the upgradient monitoring of Alternative No. 7.

Sincerely,

Robert L Osar

ROBERT L. OSAR
E. GAIL SUCHMAN
Assistant Attorneys General

Enclosures

RLO/EGS:bjs

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Environmental Protection Bureau

October 27, 1987

Anna Goidell
President
Board of Education Plainview-Old Bethpage
School District
Plainview, New York 11803

Re: Letter of September 14, 1987
Commenting on Old Bethpage
Landfill Remedial Action
Feasibility Study

Dear Mrs. Goidell and
Members of the Board of Education:

Thank you for your attendance at the public meeting on September 10, 1987, and your letter of September 14, 1987, providing specific comments on the Old Bethpage Landfill Remedial Action Feasibility Study and the proposed cleanup plan, Alternative No. 7. We have set forth below the comments from your letter and the response of the State to each one.

Comment 1: Page 1, paragraph 3.

Your letter expresses your concern and the concern of the community that proposed Alternative No. 7 will be used as supporting evidence by the Town of Oyster Bay in its attempt to locate a Resource Recovery Facility ("RRF") at the Old Bethpage Landfill.

State Response to Comment 1

Alternative No. 7 has been proposed by the State because it is the best environmental solution to the groundwater problem present at the Old Bethpage Landfill. Alternative No. 7 differs from the other alternatives mainly in the point of discharge chosen, which is hydraulically upgradient of the proposed recovery wells. The discharge water, although meeting all allowable federal and state discharge requirements, may contain low levels of

Attachment 3

contaminants. Only Alternative No. 7 provides a discharge location which will result in the recycling of this potentially contaminated discharge water back through the recovery system. This water will be recaptured and retreated and, therefore, will not escape into a non-contained environment. Furthermore, reinjection of the water into the system will speed the cleanup of the plume by "pushing" it more quickly toward the recovery wells.

In addition to the recognition of the environmental benefit resulting from implementation of Alternative No. 7, Alternative Nos. 3, 4 and 6 were deemed unacceptable because those alternatives would take approximately one and one-half million gallons of water per day from this portion of the aquifer, without replacement, contrary to the Long Island groundwater conservation policies set forth in 6 NYCRR Part 602. Alternative Nos. 2 and 4 were also rejected because, as stated in the public meetings and the Remedial Action Feasibility Study (see pages 3-1, 3-7 and 4-1), the State rejected any remediation which relied on the existence of a resource recovery facility for its operation. Alternative No. 7 does not rely on a resource recovery facility for its operation nor does it result in a contravention of the water conservation regulations.

Since the reasoning described above resulted in the rejection of Alternatives Nos. 2, 3, 4 and 6, the only other active remedial alternative was Alternative No. 5. That alternative was rejected for the reasons set forth in the State's response to Comment 2, herein. Therefore, the best remedial alternative, chosen on its own merit, is Alternative No. 7.

While it is true that the implementation of Alternative No. 7 will allow the Town to argue in its RRF permit application that a source of water will be available at the landfill, that argument is hardly dispositive of the multitude of legal, environmental and technical issues that will need to be decided before the Department of Environmental Conservation (DEC) can grant a permit for construction of the RRF. In point of fact, all the "pump and treat" remedial alternatives would provide a source of water for the RRF. The small expense of running a pipe from any discharge site to the RRF would allow the Town to argue that a source of water was available from any one of the proposed remedial alternatives.

The granting of a permit for the RRF is a totally separate and distinct legal process from the process which resulted in the selection of Alternative No. 7. The consideration of the RRF requires a complicated DEC administrative procedure, subject to public hearing and comment, which will decide whether the RRF can be permitted. That decision, just as the decision to select Alternative No. 7, will be made on the merits of the RRF itself, not on the fact that there happens to be process water available at the site. The RRF will need to pass strict technical and legal requirements for discharge, monitoring, performance, etc. Even if the RRF passes all those permit requirements, in order to be connected with Alternative No. 7, there would have to be technical confirmation that it would meet all the very stringent treatment and discharge requirements of the remedial action consent decree.

In sum, there is absolutely no significant legal or technical advantage which accrues to the Town in its application for the RRF by the selection of Alternative No. 7 over the other remedial alternatives.

Comment 2: Page 1, paragraph 3.

The officials of the Plainview Water District expressed their preference for Alternative #5.

State Response to Comment 2

As explained in detail in the response to the comments submitted by the Plainview Water District's consultant (copy attached hereto), the State strongly disagrees with the Commissioners' preference for Alternative No. 5 over Alternative No. 7. Alternative No. 5 studied the feasibility of locating a discharge basin closer to the recovery wells so that the cost of piping the groundwater to the landfill could be avoided. Areas within approximately 1500-3000 feet of the recovery wells were eliminated because it was determined that the recharge of one and one-half million gallons of water a day within that distance would interfere with the effectiveness of the hydraulic barrier to be created by these pumping wells. Areas immediately to the east and west of the landfill plume were also eliminated as possible discharge locations because those areas are potentially impacted by other sources of contamination.

The only potential area left for recharge under Alternative No. 5 was the southernmost portion of Bethpage State Park, i.e., the middle of a public golf course. Construction of a five acre treatment and recharge system in the middle of a public golf course would create a host of institutional problems. In addition, the recharge of treated groundwater in that area would be outside and downgradient of the hydraulic containment system, and approximately 1000 feet upgradient of the nearest Village of Farmingdale public drinking well. This is of concern because the treated groundwater may contain low levels of contamination. In addition, there is always a possibility that the treatment system could temporarily malfunction.

In contrast, the Alternative No.7 discharge location ensures that the treated groundwater is recycled through the system for additional treatment, at no risk to the upgradient Plainview wells (see Response to Comment 5). The environmental benefits of Alternative No. 7 weighed against the problems associated with Alternative No. 5 justify its selection as the appropriate remedy for the site.

Comment 3: Page 1, paragraph 3.

The Plainview Water District Commissioners expressed concern that even though strict discharge criteria would be applied to the cleanup, the State has experienced a great deal of difficulty in the past in obtaining compliance by the Town with orders to close the landfill and the incinerator, both of which were operating "illegally."

State Response to Comment 3

This is an enforcement action to implement a cleanup of contaminated groundwater, not one to enforce permit conditions at an operating facility. The consent decree resolving this enforcement action will be monitored by the State and the Court. The decree will provide that the State will have the right to shut down the cleanup operation, if it is not meeting the requirements of the consent decree. The consent decree will require the Town to implement all necessary modifications required to bring the remedial program into compliance with all treatment and discharge criteria prior to re-start. Since there is no incentive for the Town to operate the remedial program unless it is in compliance with State requirements *and* any non-compliance will be *immediately* stopped by the State, there is no reason to believe that consistent or repeated non-compliance will occur.

Comment 4: Page 2, paragraphs 1 and 2.

Once the Resource Recovery Facility becomes part of the remedial program, the possibility of non-compliance becomes a concern because the Town will have incentive to keep the Resource Recovery Facility (like the old incinerator) operating, even if it is not in compliance.

State Response to Comment 4

If the RRF is permitted and *if* it is allowed to use water from the remedial program, it will then be required to meet *both* its permit conditions and the requirements of the remedial action consent decree. One of the conditions that the State will insist upon, if the recovery water is used in the RRF, is that the RRF will be shut down immediately if it fails to meet the air and water discharge requirements of the consent decree. Therefore, the concern over consistent or repeated non-compliance is unfounded because the existence of the consent decree, providing immediate resort to a U.S. District Court Judge, ensures compliance with all federal and state discharge requirements.

Comment 5: Page 2, paragraph 3.

We believe that this non-compliance will result in the disposal of polluted groundwater near Plainview Water District wells.

State Response to Comment 5

"Polluted" groundwater will not be deposited near Plainview wells. As stated above, the water, whether discharged from the treatment facility of Alternative No. 7 or the RRF (if permitted and allowed to accept recovery water), will be required to meet all applicable discharge criteria. If the discharge water does not meet those criteria, the consent decree will provide that the State can shut down the cleanup operation (the recovery wells) until the Town makes sufficient modifications and adjustments to meet consent decree standards.

Furthermore, regardless of the contaminant levels in the discharge water, it will not reach the Plainview public drinking wells which are 2500 feet hydraulically upgradient of the point of discharge. As explained in greater detail in the response to the groundwater consultant to the Water District, calculations have been made to demonstrate that this recharged water will not reach the Plainview wells. In addition, monitoring well(s) will be placed between the point of discharge and the Plainview wells to insure that these calculations are accurate and that no impact will occur on the Plainview wells. If either discharge violations occur or the monitoring wells indicate a potential impact on Plainview wells, the cleanup program will be shut down immediately until appropriate modifications are made or, if necessary, a new discharge location is found.

We again wish to thank you for your comments and your participation in this public process. We have provided with this letter the entire package of written responses to all comments made at the public meetings and as submitted in writing.

After considering all the public comments received to date, the State has formally selected Alternative No. 7 as the appropriate remedial alternative for this site. This selection will now be submitted to the United States Environmental Protection Agency for review and concurrence consistent with current regulation and policy. If that concurrence is obtained, the remedial alternative will be set forth in more detail in a Remedial Action Plan which will be attached to a Consent Decree resolving the pending litigation. This Consent Decree will provide for remediation of the landfill and set forth the obligations of all the parties with respect to that remediation. The Remedial Action Plan and the Consent Decree will be subject to a public comment period prior to final approval by the United States District Court. Copies of these documents will be provided to the public on a timely basis.

Sincerely,

ROBERT L. OSAR
E. GAIL SUCHMAN
Assistant Attorneys General

RLO:rl
Enclosures

GENERAL QUALIFICATIONS

Established in 1889, Lockwood, Kessler & Bartlett (LKB) is a multidisciplinary consulting engineering firm headquartered in Syosset, New York, with branch offices in Manhattan, New York, and Norwalk, Connecticut. LKB maintains four departments: Engineering, Construction Administration, Field Survey, and Aerial Mapping. These four departments provide services in civil, environmental and transportation engineering design, site development, environmental consulting, waste management, construction management and inspection, facilities and systems planning, field survey, and aerial photography and photogrammetry. All four departments receive technical support from LKB's in-house Computer Center.

ENGINEERING

The Engineering Department offers integrated engineering and consulting services for feasibility studies, preliminary design, final design, project cost estimates and environmental consulting. The Department's staff consists of civil, environmental, geotechnical, sanitary, structural, transportation, and chemical engineers, in addition to environmental scientists, landscape architects, planners and support staff.

The Engineering Department is responsible for the following types of projects:

- Investigation and design of remedial actions at hazardous waste sites
- Solid waste management studies and facilities design
- Preparation of environmental impact statements and permit applications
- Bridge design and rehabilitation
- Traffic and transportation engineering
- Highway planning and design
- Structural design of buildings, highways, bridges and waterfront structures
- Site planning and development for residential, recreational, commercial and industrial projects
- Development/upgrading of wastewater collection and treatment facilities
- Flood control projects
- Water supply engineering
- Landscape architecture for parks and recreation areas

The Environmental Group within Engineering is responsible for environmental consulting services. LKB's environmental services have included preparation of environmental impact statements and assessments, regulatory reviews, preparation and submittal of permits, siting studies, and assistance to clients in negotiations with regulatory agencies.

CONSTRUCTION ADMINISTRATION

LKB's Construction Administration Department specializes in design review, project scheduling, construction plan analysis and quality control. Services provided by the Department also include claims analysis, CPM scheduling and soils investigations. LKB's highly experienced staff has provided resident engineering and inspection services to a wide range of projects including bridge and street rehabilitation, building construction, landfill reclamation, water and sewer line installation, road and drainage improvements, construction of parks and recreational facilities, and demolition and removal of existing structures. The Department also conducts building inspection to assess the condition of existing structures and to monitor the quality of new construction. The Construction Department staff consists of approximately 45 professional engineers, certified inspectors and support personnel.

FIELD SURVEY

LKB's Field Survey Department can provide up to ten fully equipped field survey crews to perform cadastral and geodetic surveys, photogrammetric control surveys and topographic surveys. Field Survey also provides the specialized services required for hydrographic surveys, route surveys (pipeline, utilities and roadways), and high order measurement precision surveys. The Department has over 30 years of experience in performing survey services for a wide range of construction projects including highwa transmission lines, pipelines, railroads, harbors, waste disposal facilities, and site developments for residential, commercial and industrial complexes.

AERIAL MAPPING

LKB's Aerial Mapping Department offers a total service of advanced photogrammetric techniques to meet the requirement of engineers, planners and private concerns. The following mapping services are available:

- Aerial photography
- Analytical triangulation
- Photogrammetry
- Planimetric mapping
- Topographic mapping
- Reproduction/graphic arts

COMPUTER FACILITIES

The Engineering, Construction Administration, Field Survey and Aerial Mapping Departments utilize LKB's in-house Computer Center for data processing and modeling services. The Computer Center is also used for CPM and project scheduling activities, and for fiscal monitoring and cost control. The Center is equipped with a PRIME 250 computer, plotter and other peripheral equipment, and employs the services of experienced system analysts, programmers and operators. Digitized mapping has recently been added to the Center's capabilities.

HAZARDOUS WASTE PROJECT EXPERIENCE

Hazardous Waste Remedial Investigation, Former Site of Liberty Industrial Finishing Corporation, Farmingdale, NY - Four J's Company, Syosset, NY

Preparation of a plan for investigating soil and groundwater contamination at an industrial site in Nassau County, New York. Occupants of the site were involved in the metal plating industry and had been discharging plating waste effluent to the groundwater through disposal basins. The plan developed by LKB includes the drilling of borings, collection and analyses of subsurface samples and the installation of a groundwater monitoring network. Data are being analyzed to determine the location and extent of contamination and to identify remedial actions for removal or containment of contaminated areas. Subsequent stages of this work will involve assessment of appropriate remediation measures and the development of plans and specifications for this implementation.

Heavy Metal Treatment Facility Design, Comtech Laboratories, Smithtown, NY

LKB was responsible for the design and start-up of a heavy metal waste treatment facility and related hazardous waste sludge containment area for Comtech Laboratories, a manufacturer of aerospace guidance and communication equipment. The systems were designed in compliance with all federal, state and local regulations. The project also included waste sampling and characterization, data analysis, development of treatment methodology and the preparation of preliminary plans and specifications, and operation and maintenance manuals.

Hazardous Waste Treatment Facility Design, Town of Oyster Bay, NY

LKB was responsible for the planning and complete design of a 200,000 gpd leachate collection and treatment facility located at a municipal landfill designated as a CERCLA hazardous waste site. The site received both industrial and municipal wastes whose characteristics are evident in the leachate discharging from the landfill. LKB's work included process design as well as all piping, structural, mechanical and electrical aspects of the plant design. LKB prepared all construction plans and specifications, and all operations and maintenance manuals for the facility. LKB supervised construction of this facility and is conducting ongoing monitoring and performance evaluations. This facility has been operating successfully since 1984.

Hazardous Waste Investigation, Space Machines, Inc. Site, Syosset, NY

LKB has developed an approved plan and has implemented a program of investigation at a site where spills of solvents may have occurred. The site contains machine shop operations where volatile organic compounds used in facility operations apparently contaminated soils. LKB has supervised installation of borings and collection of soil systems. The program is being performed in response to Nassau County Department of Health requirements.

Groundwater Monitoring at the Old Bethpage Landfill, Town of Oyster Bay, NY

LKB has been responsible for engineering and related services required to establish a groundwater monitoring program in conformance with state requirements at the Old Bethpage landfill. The landfill overlies a major aquifer which is utilized by numerous public supply wells. The services provided by LKB included the development of a monitoring network, selection of drilling and laboratory subcontractors, coordination with regulatory agencies, and analysis of monitoring results. LKB was assisted on specific hydrogeological issues by consulting groundwater geologists and hydrologists. Two phases of the monitoring program have been completed and a third phase is presently underway.

Hazardous Waste Remedial Investigation, Anchor/Lith Kem-Ko Industrial Site, Hicksville, NY

LKB conducted a site and groundwater investigation for an industrial client suspected of groundwater contamination by toxic chemicals from leaking storage tanks. Work involved the estabishment of a monitoring program and implementation of remedial measures.

Design of Groundwater Monitoring Facilities, Site Investigation, and Design for Capping/Closure, Syosset Landfill, Town of Oyster Bay, NY

Design of a groundwater monitoring program and detailed site investigation at a 44-acre municipal landfill designated under Federal Superfund as a hazardous waste site. Work includes historical data collection and analyses, geophysical studies, and landfill dimension study. This scope of work involves preparation of plans and specifications and supervision of construction activities, and the development of remedial actions. LKB is also preparing plans for capping, closure and gas control for the site.

Groundwater Investigation and Site Assessment, Proposed Office Complex, Middlebury, CT

As part of a detailed site assessment being conducted at a 340-acre site proposed for corporate development, LKB is conducting a soils and groundwater investigation in areas containing underground fuel storage tanks. The work involves installation of borings and monitoring wells, and collection of soil and water samples to determine the extent to which fuel may have leaked from the underground tanks. LKB also evaluated other physical, biological and socio-economic aspects of the site as part of its development feasibility studies.

Capping and Closure of Operating Landfill, Town of Oyster Bay, NY

LKB was responsible for planning, design and construction supervision for the capping and closure of a municipal landfill which had received industrial wastes and is included on the EPA Superfund List. Closure plans and specifications which addressed all civil, structural, mechanical and electrical aspects of the work included provisions for gas control, stormwater drainage, leachate collection, and establishment of vegetative cover/landscaping. Capping of 40 acres has been completed, and an effective, State-approved cap has been established.

Industrial Waste Survey, Suffolk County Department of Public Works, Suffolk County, NY

LKB conducted an extensive industrial waste inventory to identify industrial facilities which use, store or otherwise handle "priority pollutants" or "hazardous substances". The survey was specifically aimed at identifying those industries which discharge such wastes to the sewers. The inventory, which covered six wastewater treatment districts, is a key element of the County's industrial pretreatment program.

Toxic Waste Treatment/Containment Area, Smithtown, NY

LKB provided the design and supervised start-up of a toxic metal waste treatment system and sludge containment area for a major manufacturer of aerospace guidance and communication equipment. The projects included extensive sampling, data analyses, and development of a treatment methodology. From these results, and in accordance with NYCRR Park 360 requirements and local regulations, plans and specifications were prepared as well as an operations and maintenance manual.

Comprehensive Land Use and Operations Plan, Town of Oyster Bay, NY

To comply with state permit requirements, LKB prepared a comprehensive plan for long-term management of the Old Bethpage Solid Waste Disposal Complex. The plan, completed in 1983, includes the development or continuation of programs for landfill expansion, incinerator wastewater treatment, control of leachate, stormwater and landfill gas, groundwater monitoring, control of industrial waste disposal, air quality monitoring, and site closure and reclamation. These programs are carefully coordinated with ongoing operations and with the eventual development of resource recovery operations at the complex. The plan provides a long-term course of action for the Town in managing its solid wastes in a manner consistent with state and county regulatory requirements.

Report/Design and Environmental Impact Statement for Phase II Landfill Extension, Town of Oyster Bay, NY

In this major landfill project, LKB is providing all engineering and environmental work necessary to design, develop and commence operations in an extension of the Old Bethpage landfill. The landfill is listed on the Superfund National Priority List. Design of the $2.5 million extension includes provisions for a double liner, leachate collection system, and other features required by the regulatory agencies. LKB was also responsible for preparing the 6 NYCRR Part 360 permit application as well as other work needed to obtain state and county approval for the landfill expansion. The draft EIS was rcently prepared by LKB for the landfill extension. Major issues addressed in the study included: analysis of alternatives to the proposed action, potential groundwater impacts, air quality (VOC emissions) and odors, visual and aesthetic impacts, development of mitigative measures, and implications of the recently enacted New York State Long Island Landfill and Resource Recovery Law. LKB, in cooperation with the Town's counsel, provided expert testimony during lengthy adjudicatory proceedings.

Part 360 Permit Application and DEIS for the Port Washington Landfill, Town of North Hempstead, NY

LKB prepared plans and a comprehensive report to obtain a permit for the Town of North Hempstead's 90-acre sanitary landfill under the New York State's Environmental Conservation Laws, Part 360. The Town, which is located in Nassau County in the metropolitan New York area, has a population approaching 250,000. Engineering planning addressed excavation, lining with an impervious material, and design of a leachate collection underdrain system. When filling is complete, the site will be capped and vented for methane gas release. Site development planning included provisions for staged utilization, stormwater drainage system, access road network, new scale house facilities, homeowner disposal area, and final use and landscape plans. LKB's Survey and Mapping Divisions undertook the field and aerial surveys for mapping for the entire project area and its vicinity. A boring and subsoil investigation program was also conducted by LKB. LKB personnel provided numerous hours of expert testimony in support of the application and DEIS. The facility is currently under construction.

Groundwater Pollution Investigation, Hicksville, NY

This study involved a detailed investigation for an industrial client suspected of polluting the aquifer with toxic chemicals from leaking on-site underground storage tanks. Work involved the assessment of groundwater flow patterns, design of a soil and groundwater pollutant investigation, construction supervision of monitoring well installation, implementation of a monitoring program, determination of groundwater quality, identification of contaminant sources, and implementation of remedial measures.

Brookfield Avenue Landfill, Final Cover and Planting, Construction Inspection, Staten Island, NY

LKB's Construction Administration Department provided construction inspection services for the capping of the Brookfield Avenue landfill for the New York City Department of Sanitation. The work included construction management and consultation, field inspection, geotechnical testing and required revision of plans and specifications.

Hazardous Waste Investigation, Commercial/Residential Development Site, Middletown, NY

LKB recently conducted a soil and groundwater sampling program at the proposed site of a mixed use commercial/residential development on 30 acres in Orange County, NY. Site reconnaissance determined evidence of potential hazardous waste disposal on portions of the site which was formerly a construction company storage facility. LKB developed an extensive sampling program and conducted chemical testing to fully assess the extent of contamination, and possible need for remediation, on the development site.

PERSONNEL QUALIFICATIONS

Lockwood, Kessler & Bartlett, Inc. has a staff of over 150 engineers, environmental scientists, planners, surveyors, construction inspectors, field technicians, and other support personnel. They are trained and experienced in all the disciplines necessary to provide full support to LKB's civil engineering and design projects. The distribution of personnel by discipline is summarized below:

Engineers	
Chemical	2
Civil	11
Electrical	1
Mechanical	3
Sanitary/Environmental	9
Soils	1
Structural	5
Transportation	7
Landscape Architects	3
Surveyors	25
Architects	1
Construction Inspectors/ Field Technicians	38

Scientists	
Ecologists	2
Geologists	2
Hydrologists	1
Hydrogeologists	2
Planners	4
Support	
Cartographers/ Photogrammetrists	4
Computer Programmers	4
Photo Lab Technicians	2
Draftsmen	12
Administrative	20

LKB CONSULTING ENGINEERS
Since 1889

JOHN P. LEKSTUTIS, P.E.
Vice President - Senior Environmental Project Advisor

EDUCATION/REGISTRATION

B.E., Civil Engineering, Manhattan College, 1965
M.E., Sanitary Engineering, Manhattan College, 1966

Registered Professional Engineer in NY, NJ, CT, MA, RI, ME, WA

EXPERIENCE

Mr. Lekstutis has more than 21 years of experience in the fields of civil and sanitary engineering, environmental science, and hazardous waste management. During this time he has addressed and managed technical, economic, environmental and engineering programs from inception through implementation for major industrial and municipal projects. Mr. Lekstutis serves as senior advisor on all environmental projects. He is currently directing environmental projects for: groundwater contamination at municipal solid waste landfills at Syosset and Old Bethpage; preparation of a generic EIS for the Melville-Route 110 corporate office corridor in Huntington; and engineering and environmental services for a 1500-acre corporate office park development in Connecticut for IBM Corporation.

Before joining LKB, Mr. Lekstutis was Director of Environmental Engineering and Sciences for Envirosphere Company, a Division of Ebasco Services Incorporated. He was responsible for managing Envirosphere's eastern environmental operations on projects represented by a capital investment in excess of $10 billion. He also planned and directed that firm's entry into the hazardous waste field. His responsibilities included the development, design and implementation of remedial engineering measures such as: groundwater monitoring and management; excavation, removal and safe disposal of wastes; in-place encapsulation; lagoon and tank farm closure; and in situ chemical treatment. Mr. Lekstutis' other experience includes site investigations, engineering feasibility evaluations, EIS reports, and economic studies for major project undertakings throughout the U.S. Specific projects included: coal storage and shipment terminals; coal gasification and other alternate fuel production facilities; high voltage transmission lines; coal fired electric generating plants; and industrial chemical manufacture.

Mr. Lekstutis recently directed a remedial investigation, feasibility and engineering design program for a former coal gasification/disposal site in central New Jersey. The work scope for this program included: detailed site investigations of the air, soils and groundwater to establish the extent and character of buried coal tar residues; a risk assessment to establish the critical health and environmental pathways of contamination; an engineering feasibility study to select a remedial program; engineering design and construction oversight of the remedial measures; and interface and negotiation on behalf of the former owners with local communities, local governments and the New Jersey Department of Environmental Protection.

LKB CONSULTING ENGINEERS
Since 1989

IVAN POUSCHINE, JR.
Director of Environmental Engineering

EDUCATION/REGISTRATION

B.A., Engineering, Harvard College, 1952

Graduate Studies, Political Science, Georgetown University, 1956

EXPERIENCE

Mr. Pouschine has over 35 years of consulting engineering experience, and he has served as Project Manager or Director on numerous water supply and wastewater treatment projects world-wide, including hazardous waste remediation. Presently, Mr. Pouschine is LKB's Director of Environmental Engineering, directing a wide range of environmental projects for both private and municipal clients.

Among the projects he has directed or managed are:

- Hazardous waste management studies at several industrial sites including development of plans for investigation and remediation and performing the required investigations.
- Investigations and designs of waste pickle liquor collection and disposal systems at Bethlehem Steel's Sparrows Point Plant and US Steel's Gary Plant, including supervision of construction and start-up.
- Comprehensive investigations of industrial wastewater, and preparation of reports and recommended treatment facilities for US Steel Corporation's Gary Steel, Gary Tube, National and Elwood Works; Bethlehem Steel Corporation's Sparrows Point Plant including the shipyard, and Lebanon and Bethlehem plants; and Cities Service Lake Charles Refinery.
- Pilot plant testing and report on removal of organic contaminants in Glen Cove, NY, drinking water, funded by the USEPA, and arranging for continued testing to remove pesticides in Suffolk County, NY. The Glen Cove pilot plant operations included testing of several different aeration systems, carbon adsorption, proprietary resin absorption, regeneration by steam of both carbon and resin over a three year period.
- Evaluation of USEPA wastewater effluent guidelines for the coal and ore mining, synfuels, and ferrous metals industries. Technical assistance to EPA Region III concerning achieving of limitation guidelines at six steel plants. Treatability studies of filtering combined sewer overflows and polishing secondary treatment plant effluent.
- Comprehensive master plan, design and start-up of a regional combined industrial-municipal wastewater treatment plant for Como, Italy, handling 127 wet process industries including voluminous textile wastes.

LKB CONSULTING ENGINEERS
Since 1889

RAYMOND W. WEGENER
Chemical Engineer

EDUCATION/REGISTRATION

B.E., 1973, Chemical Engineering, Manhattan College, 1973

EXPERIENCE

Mr. Wegener has over 14 years experience in environmental engineering, and is currently involved in the design phase of a groundwater remediation treatment system for a municipal client.

Since joining LKB in 1980, he has been responsible for one or more facets of the off-site methane gas control work at the Old Bethpage Landfill, Port Washington Landfill and Syosset Landfill in Nassau County, NY. His responsibilities included preliminary and final design, equipment specification, start-up and operation, data collection, gas sampling and follow-up inspections.

Mr. Wegener has prepared extensive theoretical landfill gas estimates for the Old Bethpage landfill, which were used as a guidance document in developing a RFP to exploit landfill gas as an energy resource. He has also designed a leachate treatment facility for the Town of Oyster Bay, now built and operational at the Old Bethpage landfill. The 200,000 gpd plant treats leachate collected from portions of landfill, which has been designated as an EPA Superfund site because of a history of industrial waste dumping. Mr. Wegener was responsible for initial feasibility and treatability studies, preliminary and final design, equipment specification, start up and operation, and preparation of a comprehensive operation and maintenance manual for the plant. He has performed similar duties for a municipal incinerator wastewater treatment plant.

Prior to joining LKB, Mr. Wegener was Laboratory Director of Ecolotrol, Inc., Bethpage, New York. His responsibilities there included wastewater sampling, data collection and interpretation, treatment plant design, report preparation, specification coordination and start up procedures related to the New York State Discharge Elimination System Program (SPDES) and NPDES outside New York. In this capacity, Mr. Wegener also directed treatability studies for a number of industrial clients such as; Engelhard Industries, Lipton Foods, American Cyanamid, Kind and Knox, and Pfizer, Inc. Mr. Wegener had conducted pilot and bench scale treatability studies on leachates and wastewater contaminated with metal refining wastes, high strength ammonia wastes, animal wastes, and electroplating and coating wastes.

Mr. Wegener has published articles for the preceedings of the New York State Association for Solid Waste Management and Pollution Engineering relating to off-site methane gas control and leachate management.

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PAUL LAPPANO, P.E.
Project Manager

EDUCATION/REGISTRATION

B.S. Civil Engineering, State University of New York at Buffalo, 1975

Registered Professional Engineer in State of New York

EXPERIENCE

Mr. Lappano has 12 years of experience in environmental and civil engineering. As Project Manager for several environmental projects, he is responsible for site investigations at landfills and hazardous waste sites, and for the design of solid waste management and remedial facilities. Mr. Lappano has been responsible for the design of landfill expansions, methane collection systems, leachate collection systems, liners and caps, and final land use plans. He has also been responsible for completing necessary regulatory permits and applications. Mr. Lappano is currently involved with the development of detailed plans and specifications for landfill, gas control and capping of a 35 acre inactive hazardous waste disposal site.

Mr. Lappano has conducted site investigations at several inactive and active hazardous waste sites on Long Island. As part of these studies, he used historic aerial photos to determine prior landfill boundaries and expansions, and to check for the presence of drum stockpiles, waste lagoons, and other evidence of individual waste disposal. As part of LKB's site development projects, Mr. Lappano has also used aerial photography to check for possible waste dumping on several large parcels of land proposed for corporate development.

Mr. Lappano's consulting experience prior to joining LKB includes the preparation of engineering designs and reports for the construction of solid waste management facilities in the Towns of Southold, Riverhead, and Huntington, New York. He designed an HVAC system, structural roofing, and the odor control system for a $1.5 million underground advanced industrial waste treatment plant. He also contributed to a waste volume report and participated in an operations study, for the 10,000 TPD New York City Freshkills Landfill.

As a solid waste engineer for the New York State Department of Environmental Conservation, Mr. Lappano gained additional experience including engineering review of 15 landfills, 12 transfer stations, three incinerators, and four resource recovery facilities. These studies were conducted to ensure compliance with state standards under 6 NYCRR Part 360 - Solid Waste Management Facilities, for groundwater monitoring wells, methane monitoring and venting, leachate collection and treatment, incinerator residue disposal, and transfer station capacities.